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VIEWS, NEWS AND INTERVIEWS.

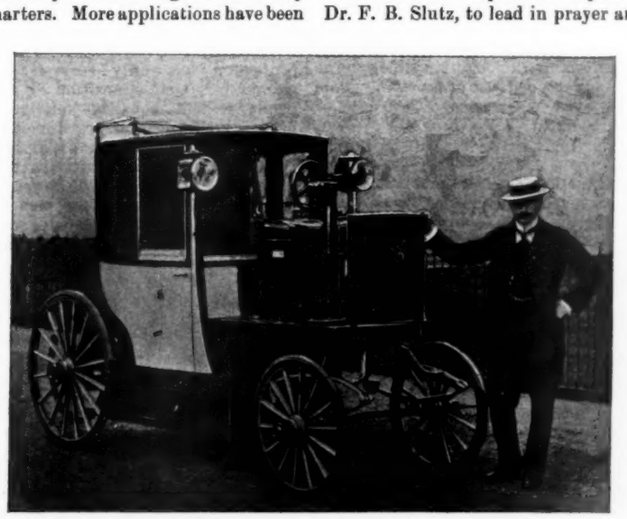
A syndicate has been formed in Yokohama for the purpose of telegraphically connecting Yokohama direct with San Francisco via Hawaii. The cable will cost $11,000,000, and the Japanese Government has promised to defray $500,000 of that sum.

A London daily paper prints the following: "The Secretary for War has approved of the officers who are shortly to be appointed to the new corps of Electrical Engineer Volunteers, going through courses of training this year at Shornmead Fort, in the Thames defenses, and at the submarine mining station in the Isle of Wight. Beside Major J. Hopkinson, a former president of the Institution of Electrical Engineers, who has already been gazetted to the command, and Captain Brady, Royal Engineers, who has been appointed adjutant, the names of several gentlemen associated practically with electrical science have been submitted to the War Office for commissions; and a large number of men employed in electrical works in the eastern suburbs of the metropolis, as well as members of the Institution of Electrical Engineers, have expressed their willingness to join the ranks of the corps, whose principal duty will be in working electric lights at defended ports where there is a deficiency of trained regulars, and in connection with submarine mining. Actual enrollment of the rank and file for the four companies which it is proposed shall be the first establishment, will be deferred probably for a couple of months, as it would be impossible for the men to become efficient for the current year, which ends on the 31st of October. It is proposed that the regimental headquarters shall be in the neighborhood of Greenwich, to suit the convenience of the many employés of local works, from which a large proportion of the recruits are expected." The following official appointments in the corps have been announced: William, Lord Kelvin, is appointed to the honorary colonelcy of the corps. Rookes Evelyn Bell Crompton (late lieutenant 57th Foot), Alfred Ebenezer Mavor and Robert Stewart Erskine are appointed captains. The undermentioned gentlemen are to be lieutenants: Alfred Ernest Le Rossignol, Walter Adolph Vignoles, and Henry Meredith Leaf.

Indications at present point to a decided growth of electric street railway construction in Massachusetts during the coming year. A large number of applications have been received the past month for papers necessary for obtaining street railway charters. More applications have been received during the past few months than in any previous similar period.

George V. Trott, a former telegraph operator, has devised a system which will shortly be put in operation on the Pennsylvania Railroad, by which every train on the line will be in constant telegraphic communication with the station next ahead, and when desired, with the train dispatcher or any public telegraph station.

A press dispatch from Wichita, Kas., says that the only Sunday-school in the United States ever conducted by telephone is that connected with the First Methodist Episcopal Church in Wichita, and directed by superintendent W. E. Stanley from his sick bed. The Sunday-school is the largest in Kansas. For more than 20 years Mr. Stanley has served as its superintendent. On the 18th of July he was thrown from his buggy and sustained a broken thigh. His friends sent to New York for three megaphones, and by attaching them to telephones connecting Mr. Stanley's home and the church, Mr. Stanley was enabled to hear what went on in the church auditorium and to make his voice audible to the people assembled there. He requested the pastor, Dr. F. B. Slutz, to lead in prayer and announce the songs. After the class recitations he asked James Allison, a cousin of President McKinley, to conduct the lesson review. Mr. Stanley afterward made an address to the school. Mr. Stanley, in his bed, then listened to the sermon by Dr. Slutz.



A LONDON ELECTRIC CAB.

In Baar, Switzerland, there is a 10,000-spindle cotton mill run by electric power from the Rhone, which is only 550 feet away. There are three motors kept in a separate room to protect them from the dust, and of these one drives the openers, cards, combing machines, drawing and flyer frames and supplies 260 lamps; another drives the mules, and the third the ventilating fan and workshop.

Electric Cabs in London.

In last week's ELECTRICAL REVIEW was printed an article giving a detailed account of the establishment of an electric cab service in London similar in many respects to that inaugurated in New York city a few months ago. We are now enabled to present herewith an illustration showing one of the London electric cabs.

In its general external appearance the cab, but for its color, which is a bright yellow, resembles a one-horse *coupé* without the horse. There is only a single seat in the interior, well cushioned and comfortable and of ample width for two and a half persons. The uncomfortable *strapontin* of the foreign cabs has not been added. The tires are of solid rubber and the running is very comfortable, and silent moreover, only a faint note from the motor being occasionally heard. There is an electric lamp in the interior of the vehicle, and the outside lamps are also electric. The steering is effected by the two front wheels, through ordinary worm gearing turned by a handle on the driver's right hand in the usual manner.

The motors have been specially designed for these cabs. They are of the Johnson–Lundell type, and supplied by the Interior Conduit and Insulation Company, of New York. The fields have two similar windings and the armatures have also two similar sets of windings and two commutators. This doubly-wound motor is connected to a series-parallel controller of the usual American pattern, in exactly the same way as the two motors of a tramcar would be connected to it. The "Bersey" controller, which it was originally intended to use, did not prove so suitable.

The controller is arranged so as on the first step to connect the two armature windings and the two field windings to the cells in series with a small starting resistance; this is not a running speed, but is only intended to start the motor into motion. On the second step the windings are still in series, but the resistance is cut out, and with this arrangement the cab runs at a speed of about three miles

an hour. The third step places the armatures in parallel, but leaves the fields in series, and with this connection the cab runs at about seven miles an hour. The fourth step places the field windings in parallel, and the cab runs at nine miles an hour. It will thus be seen that three normal running speeds allow of the full energy of the current being utilized in the motor without any absorption in resistance, and the cab can thus "crawl," using only about the same number of watt hours per car mile as when running at full speed. In the reverse direction from the top position the series parallel controller on the first step short-circuits the motor through the starting resistance, thereby gently braking the cab. On the second step backwards the motor is completely short-circuited, bringing the cab to a dead stop; and the third step backwards reverses the connections between the armatures and fields, all being in series, to enable the cab to be moved at the slowest speed backwards. The whole of these movements are produced by the use of one lever placed at the left-hand side of the driver's box. The removal of a plug beneath the driver's seat disconnects the controller from the motor and cells. The circuit from the accumulators to the controller and motor passes through a switch attached to the foot brake, which can also be used for bringing the cab to a stop. This switch is arranged to break the circuit when the foot brake is applied. It is therefore impossible for a careless driver to apply the brake whilst the current is still passing through the motor. The foot brake has another advantage in the crowded London streets, for when moving in a block the driver can set his controller handle to slow ahead, and then start and stop the cab time after time as the traffic slowly moves on by simply putting on and taking off his foot brake. We are indebted to the London *Electrician* for the above particulars and the accompanying illustration.

President Partridge Resigns.

Col. John N. Partridge tendered his resignation as president of the Brooklyn City & Newtown Railroad Company, better known as the De Kalb Avenue road, last week. John I. Heins, the general superintendent, was elected president. Colonel Partridge assigned his contemplated departure on an extended European trip as the cause of his resignation. He was said to be opposed to the consolidation of the De Kalb Avenue and the Coney Island and Brooklyn roads, which has been favored by a majority of the directors. It is expected that the Brooklyn Rapid Transit Company will soon acquire a controlling interest in the De Kalb Avenue and the Coney Island and Brooklyn trolley systems.

Colonel Partridge is one of the best known and most popular of street railway men, and it is to be hoped, will soon re-enter this active field.

Now that the De Kalb Avenue and the Coney Island and Brooklyn railroads are in joint operation, the patrons of the former line have access to the ocean. The fare to the beach from the bridge and ferries will be only five cents.

THE PRECISION OF ELECTRICAL ENGINEERING.

INAUGURAL ADDRESS OF THE PRESIDENT, AT THE 14TH GENERAL MEETING OF THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, ELIOT, ME., JULY 26, 1897, BY FRANCIS B. CROCKER.

There still exists quite a general idea that electricity is so imperfectly understood that its laws and actions are little more than matters of chance or guesswork. The experience of the electrical engineer is supposed to consist of a series of surprises and shocks to his mind as well as to his body. This notion is not confined to the ignorant, but is believed by many educated persons, even including our brother civil and mechanical engineers; indeed, some members of our own profession hear this opinion expressed so often that they partly accept it as true, or at least they have no ready arguments with which to refute it.

The existence of this popular error concerning electricity is perfectly natural, and arises from the novelty of the subject and the fact that its development has been so great and so rapid that no one but a few specialists have been able to keep pace with it.

The subtlety, extreme rapidity of action, and the astonishing achievements of this modern agency make it appear most mysterious and occult in comparison with the ordinary forms of energy, such as heat and mechanical power. Possessing such transcendental powers, it is looked upon as something not only unknown, but unknowable, an irresponsible power for great good or great evil. This idea has sometimes been the cause of actual harm to the progress of electrical engineering. The profession has been considered to be hardly legitimate, those who practiced it being regarded as either wizards or charlatans, or a combination of the two. During the present year the president of a large steam railroad system, on which electric propulsion is being tried, publicly expressed his opinion that electrical engineers know little or nothing of their subject. In legal decisions in this country and abroad, judges have stated that electricity was so vaguely understood that testimony concerning it was of no practical value.

It has also been held by many courts that electricity, being intangible, has no real existence, so that the tapping of current from the wires could hardly be considered as a theft, except in an imaginary sort of a way. The production of electrical energy in central stations has been decided by metaphysically inclined judges to be a totally different kind of business from the manufacture of gas. In point of fact, the differences are all in favor of the practical character of electricity. More useful operations can be performed by it; it can be more easily transmitted and distributed; the percentage of leakage is less, and its measurement is far more convenient and accurate.

The idea that "no one knows what electricity is, therefore we know practically nothing about it," is often expressed by those who want to excuse their own ignorance of the subject. They are glad to think that they are no more worse off in this respect than the rest of the world. Their deduction is quite natural, but is absolutely fallacious. While we must admit that we do not know the real nature of electricity, the same limitation of knowledge applies to all other fundamental facts. Gravitation is the most familiar of natural phenomena, yet we have no conception whatever of what it actually is. Our theories and mental pictures of the nature of electricity are much more definite than those concerning gravitation. In regard to the latter, little progress has been made since the time of Newton, while electrical knowledge has advanced and is now advancing with giant strides. There is every reason to believe that we shall "know what electricity is" and be able to explain the inherent mechanism by which electrical actions take place, before we understand how and why a stone is drawn to the earth. What we do know, however, are the laws of both electricity and gravitation, as well as the results that they produce, and it is very doubtful if our ability to control, measure and utilize these agencies would be improved even if we understood their exact nature. The laws and applications of hydraulics would be just as definite and successful even though the fact were not known that water is composed of two atoms of hydrogen and one of oxygen. It is possible that methods of generating electricity may be advanced when its real character is discovered, but it is not likely that this knowledge will greatly affect the methods of handling and using it.

The popular ignorance and doubt concerning electricity is rapidly disappearing in consequence of the remarkable results accomplished by it during the last 10 or 15 years, but it will not be out of place, I think, to consider at this time the remarkable exactness which electrical engineering has reached. A discussion of this question may serve to inform laymen who are not familiar with the facts, and may also be a matter of interest and satisfaction to ourselves. This profession has only very recently gained for itself a position of independence and equality among the branches of engineering, but it can now fairly claim to be an example for the others to follow, not only in the magnitude and rapidity of its results, but also in the exactness and certainty of its methods. Let us consider what are the principal facts upon which this strong claim is based.

The names connected with electrical science—Gilbert, Franklin, Faraday, Ampere, Maxwell, Henry, Helmholtz, Kelvin, and a long list of other distinguished electricians, are not men whose ideas are vague or incorrect. Indeed, it is a significant fact that the ablest and most profound scientific men have been attracted by and have performed some of their best work in the study of electricity.

The rapid progress of electrical science and its applications is an absolute proof of sure and exact knowledge. Uncertainty would necessarily cause delay, and error would involve repeated trials before success could be reached. The fact that the difficult arts of long-distance transmission of power and electric traction have been developed to their present state of importance and success in about ten years, shows conclusively that electrical theories and designs agree very closely with the actual facts.

The great results accomplished by electrical engineering is probably its strongest claim. Many of these are so unique and astonishing that we still regard them with wonder, even after we have become familiar with them. Among the most striking of these examples are the locating of faults on submarine cables, telephoning a thousand miles or more, transmitting power over one hundred miles, sending simultaneously a number of messages on the same wire, utilizing the power of Niagara, and producing the Roentgen rays. These and hundreds of other wonderful feats are not accomplished by chance, or by groping in the dark.

The close relationship between pure and applied electrical science is still another proof of the exactness and truth of both. If knowledge were complete, theory and practice would become identical. The agreement between theoretical and practical electricity is largely due to the small losses which occur in electrical apparatus and processes. Even quantities which correspond to friction in mechanics, such as electrical resistance and magnetic hysteresis, are capable of exact calculation. It is only the purely non-electrical factors, such as the friction of bearings and air resistance, that are uncertain in designing electrical machinery. The almost infinite rapidity of electrical action makes the time element so small that it can almost always be neglected. This greatly simplifies calculations and renders their results more accurate. The fact that there is only one kind or quality of electricity also gives definiteness to our ideas and calculations. With coal we must know its quality, including both its physical and chemical properties, in order to make even approximate calculations concerning it. In the case of steam, pressure and volume are not sufficient data; the amount of moisture or superheating must also be known. The most accurate methods of the physicist are not any too good nor beyond the reach of the electrical engineer, and they are often employed by him. A notable example of this is Lord Kelvin's work in connection with laying the Atlantic cable, which was undertaken at about the same time that he began to publish his essays on the vortex theory of matter. When Werner Siemens first built his self-exciting dynamos, he also constructed the sensitive galvanometers used in the researches of his friend Helmholtz. It was Siemens, the electrical engineer, who gave his money and influence to the Reichsanstalt, an institution where the most accurate physical work is now being carried on.

The historical example of the agreement between electrical theory and fact is the brilliant work of Ampere, who gave to the world a beautiful and complete theory of electromagnetism within a few days after he heard of its discovery by Oersted. The work of Maxwell is another great example of the power of the intellect to deal with electrical problems.

Hertz said, in regard to Maxwell's electro-magnetic theory of light: "It is impossible to study this wonderful theory without feeling as if the mathematical equations had an independent life and an intelligence of their own; as if they were wiser than ourselves, indeed, wiser than their discoverer; as if they gave forth more than he had put into them. And this is not altogether impossible; it may happen when the equations prove to be more correct than their discoverer could with certainty have known."

It can hardly be admitted that there is anything in Maxwell's equations that he did not put into them, but the remarkable experimental corroboration of Maxwell's theories many years after they were evolved, shows that from a few fundamental truths almost the whole theory of electricity may be deduced.

This power to solve problems successfully by *a priori* reasoning demonstrates the perfection of electrical science. We can arrive at the facts by reasoning out what they ought to be; hence we may say that electrical science is ideal. In other branches

of applied science, as for example in civil engineering, the corrections, factors of safety and other allowances are often much greater than the original quantity itself. In such cases it is obviously impossible to go very far from an experimental fact by any process of reasoning. The errors would immediately become so magnified that the truth would be greatly distorted or lost entirely.

To take a concrete example, the losses in transforming electrical energy are only two or three per cent, and if an error of 10 per cent is made in calculating these losses, the actual error is only two or three-tenths of one per cent. It would, therefore, be possible to design a system in which electrical energy was transformed many times, and yet the final error would only be one or two per cent. If, on the other hand, the losses in mechanical engineering are 10 or 20 per cent, or even 50 per cent, as is often the case, an error of 10 per cent in calculating these quantities would soon become multiplied to a large figure.

Exactness in electrical units and terms is another strong point of electrical engineering, because definiteness in terms and ideas go hand in hand. The system of electrical units is complete and scientific, being based directly upon the C. G. S. system, and is the only example of a set of units which are universally adopted. The metric system is not in use in the United States, England and her possessions and many other countries, but the same electrical units are accepted by all nations. This avoids the great confusion which arises from the use of several different units for the same thing, as is the case in steam engineering, in which at least four different heat units are commonly employed.

In electrical engineering the distinction between the various quantities is usually more clearly understood, as for example the difference between force, work and power. In other branches these quantities were often confused, and the fact that mistakes of this kind are not more often made at present is largely due to the influence of electrical engineering in the accurate use of terms. The useful word torque has been introduced through electrical engineering, although it is a purely mechanical quantity. The adoption of such terms as impedance and reactance gives a nicety of expression which is rarely found in other applied sciences.

The facility and accuracy of electrical measurements contributes greatly to the precision of electrical engineering. Volts and amperes can be easily, quickly and accurately measured by means of convenient portable instruments. The product of these volts and amperes gives the watts or power, which is the most important quantity.

If desired, a single instrument—the wattmeter—can be used to combine the two quantities. Electrical resistance can also be measured easily and quickly, and with still greater accuracy. Even the less common electrical quantities, such as capacity and inductance, can be measured without much difficulty and with reasonable exactness. The magnetic quantities are also quite easily and correctly determined. As already stated, the most doubtful factors in electrical engineering are the mechanical ones.

The enormous range in electrical engineering is still another proof of its precision. The same laws and principles which apply to the almost infinitesimal galvanometer current are equally applicable to the current from an electric light station. The former may be only a hundred billionth of an ampere and the latter reaches 10,000 amperes, which is a thousand million million (10^{15}) times greater.

An even greater ratio than this represents the range of resistance measurements. In the case of large copper bars, a determination to within .000001 ohm is often required, and for insulation testing 10,000 megohms is not an unusually high figure. This gives a range of measurement of ten thousand million million (10^{16}).

An electrical instrument, the bolometer of Professor Langley, is used to measure the heat received from the fixed stars, and electricity is also the agent selected when 100,000 horsepower are to be distributed from Niagara. Instead of saying that electricity is selected for these extreme uses, it would be more correct to state that it must be employed, just as it is the only means of transmitting speech a thousand miles, or performing the many other miracles of which it alone is capable.

(To be concluded.)

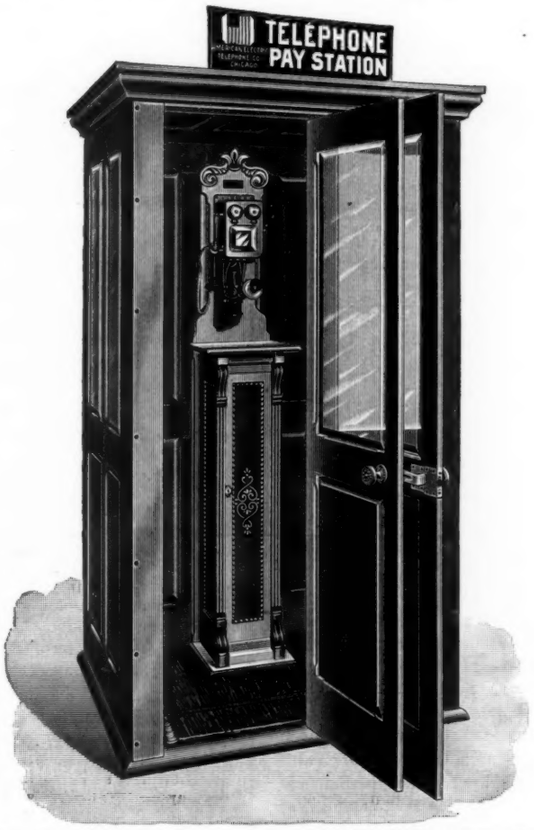


FIG. 1.—NEW TELEPHONE BOOTH OF THE AMERICAN ELECTRIC TELEPHONE COMPANY, CHICAGO.

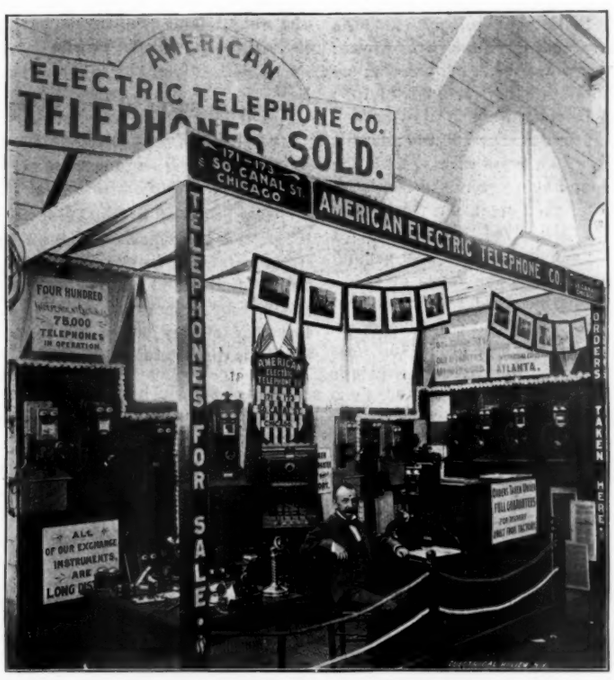


FIG. 2.—VIEW OF THE NASHVILLE EXHIBIT OF THE AMERICAN ELECTRIC TELEPHONE COMPANY.—REPRESENTATIVE PAUL W. BOSSART IN COMMAND.

MANUFACTURING NOTES.

Antonia Navarro, 1395 Lexington avenue, New York, is importing a grade of mica claimed to be particularly well adapted for electrical uses.

The selling department of the C & C Electric Company shows an active demand for electrical machinery and the factories at Garwood, N. J., are apparently operating with a large complement of men.

The telephone installations for interior service made by Taber & Mayer, of Boston, during the past year include quite a large list of the largest buildings and manufacturing establishments in New England.

The Gales commutator compound is one of the specialties that pleases every user, and the recent reduction in price by the manufacturers, McLennan & Company, Chicago, has brought a rush of new orders.

The "Cross" oil filter, made by the Burt Manufacturing Company, of Akron, Ohio, is especially constructed for electric light and power plants. The capacity of these filters ranges from 3 to 120 gallons of oil.

A Telephone Exhibit at the Nashville Exposition.

The American Electric Telephone Company, of Chicago, installed a very comprehensive and interesting exhibit of telephone apparatus in the exposition at Nashville. The display has attracted a great deal of attention, and it includes the various types of telephone sets, switchboards, etc., manufactured by this company. Mr. Paul W. Bossart, general agent of the American (and who is pictured in the illustration shown), arranged the exhibit.

The American Electric Telephone Company has recently brought out a handsome telephone pay station booth, which, with characteristic sign on top, is shown in Figure 1 on this page.

Car Barns Burned in Brooklyn, N. Y.

A fire which destroyed the repair shops and car barns of the Nassau Electric Railroad, at Thirty-sixth street and Church avenue, Brooklyn, N. Y., occurred early last Friday morning. Four buildings, occupying an entire block, were swept away and only bare walls remain. The damage, it is estimated, will reach over $200,000.

Two motormen who were asleep in the armature room were rescued. They were unconscious from smoke. Sixteen trolley cars were destroyed.

Assisting Mrs. Lufkin.

The friends of the late Mr. Harvey L. Lufkin, a gentleman widely known to the electrical fraternity, learning that his widow had been left without any income, have formed a committee to undertake the collection of funds for her benefit. The committee is composed of James W. Godfrey, George F. Porter, C. O. Baker, Jr., Robert B. Corey and Joseph Wetzler, and all communications should be addressed to Mr. Godfrey, 15 Cortlandt street, New York. The committee announces that the case is an urgent one, and that any contribution, however limited, will be welcome.

ELECTRIC RAILWAY NOTES.

The Hanover, Mass., Railway Company carried 274,000 passengers last year.

The Standard Air Brake Company, of New York city, has recently closed several important contracts for their various types of apparatus.

It is reported that a branch of the Gloucester, Essex & Beverly, Mass., Street Railway is to be built to Ipswich beach, connecting with the present road to that town at the school-house corner, Candlewood, and crossing Horton's field to the beach road.

It is reported that Col. A. H. Swan, of Ogden, Utah, and Attorney Frank L. Pushaw, of Boston, are in Pittsburgh to establish a $100,000 plant to manufacture the Skinner–Dorlan electric brake. The brake has been tested on the Avalon division of the United Traction system.

It is stated upon reliable authority that a movement is on foot among local capitalists and moneyed men of Missouri to organize a railroad and park company for the purpose of improving Bonner Springs near Kansas City, and building an electric line to that beautiful little resort.

By the terms of the sale of the Cincinnati Inclined Plane Railway to the Cincinnati Street Railway Company, the first mortgage bondholders will get about 75 cents on the dollar, the record mortgages 52 cents, the preferred stock nine cents, and the common three cents. The road was owned in Louisville, Ky. The price received was $372,500.

The M. F. Maline Company, of Chicago, has applied for a receiver for the Indianapolis, Anderson & Marion, Ind., Electric Railroad Company, in process of construction. It is charged that work on the road has ceased and the claim of the company on the road is thereby endangered, as the value of the franchises, etc., will be impaired. It is claimed the road has been insolvent since August, 1896, and has failed to meet its bills.

The Realty Syndicate has taken possession of the East Oakland, Cal., Electric Road. The system is sold under foreclosure to Frank C. Havens, representing the syndicate, for $60,500. This is the third street railway system that has come under the control of the Realty Syndicate during the past few months. The East Oakland road will be operated in conjunction with the Oakland Consolidated line and the Alameda, Oakland & Piedmont Company's road.

Plans have been completed for a great electric railroad between Chicago, Ill., and Green Bay. The new road will be 250 miles in length and take two years to build. Milwaukee capital is behind the projected enterprise. A number of Wisconsin capitalists will unite with the Milwaukee Electric Lighting and Street Railway Company. Oconomowoc, Racine, Milwaukee, Waukesha, Kenosha, Waukegan, Oshkosh, Neenah, Menasha, Fond du Lac, Appleton, Kaukanna and Depere will be stopping points on the road. Work on the road will begin on October 1.

Robert Bollin met with a painful accident one night recently at the power-house of the Citizens' Street Railway Company in Memphis, Tenn. He was a member of the night force that is at work sinking wells at the power-house, and, during the resting hour from 12 to 1 o'clock at night, he stretched himself full length on one of the big belts with his feet toward the flywheel. When the engine was started the belt carried him under the wheel until his feet, legs and hips were badly crushed.

The report of the Syracuse Rapid Transit Railway Company for the quarter ending June 30, filed with the State Railroad Commission, shows: Gross earnings, $106,308; operating expenses, $67,921; net earnings, $38,387; other income, $1,228; gross income, $39,615; fixed charges, $43,908; deficit, $4,293. The general balance sheet shows assets of $7,380,967, including $7,094,266 for cost of road and equipment, and $26,034 cash on hand. The liabilities include $2,750,000 capital stock, $3,250,000 funded debt and $15,833 profit and loss (surplus).

It is reported that a controlling interest ($150,000), in the consolidated mortgage bonds of the Lewiston & Auburn, Me., Electric Railroad, has been purchased by a syndicate, consisting of G. C. Moses, F. Twitchell, of Bath; I. C. Libby, of Waterville; and A. F. Gerald, of Fairfield, in connection with Boston and New York capitalists. It is proposed to reorganize the company and issue new bonds for building extensions to Brunswick, Bath, Turner and Sabattus, 81 miles in all. The company now operates 14 miles of track from Lewiston to Auburn.

The report of the Syracuse East Side Railway Company for the quarter ending June 30, shows: Gross earnings, $8,351; operating expenses, $6,648; net earnings, $1,703; other income, $50; gross income, $1,753; fixed charges, $3,940; deficit, $2,187. The gross earnings for the corresponding quarter last year were $10,212, the operating expenses, $8,252; the fixed charges, $4,151 and the deficit $2,191. The general balance sheet shows assets of $536,669, including $511,153 for cost of road and equipment; $982 cash on hand, and $23,580 profit and loss (deficiency). The liabilities include $250,000 capital stock and $250,000 funded debt.

The Metropolitan Street Railway Company, of Kansas City, Mo., is contemplating a change in power for the Fifth street cable line within the next few weeks. The experiment in running the Summit street cable by motors has proved entirely satisfactory and, besides being much cheaper than operating the old steam plant, the cable runs more uniformly in speed. An officer of the company said recently that another generator and engine would soon be placed in the new power-house at Riverview, similar to the one there at present, at a cost of $60,000. The present engine and motor are operating 55 miles of electric and cable roads, with no power to fall back on in case of accident.

At the annual election of the stockholders of the New York, Elmsford & White Plains Electric Railway Company, the following directors were elected: Samuel R. Bullock, of Philadelphia; Herbert F. Jennings, William D. MacQueston and Charles B. French, of Mount Vernon; Virgil A. Krepps, of White Plains; Dwight S. Mason, Charles V. D. Peck, Paul Armitage and W. J. McCormick, of New York city. The completion of the line to the Hudson River Railroad station at Tarrytown is to be taken hold of at once, so as to have cars running by September 23. After this is accomplished the work on the extension of the line to Mamaroneck will be pushed to a speedy completion.

N. E. Springsteen and his son Frank, of Birmingham, Mich., have invented a new kind of a fare register for street cars. It looks like an old-fashioned pepper box. Inside it is a cylinder on which is wound long strips of consecutively numbered checks. Every passenger paying a fare is given a check. As the conductor is starting out for the day, the number is taken of the first check that will come out of the box. When he turns in his box at night the number is again taken. His ticket and cash account must agree with the number of checks he has taken from the pepper box. The Detroit & Pontiac Electric Company will use the pepper boxes. Four different rates of fare are collected between Detroit and Pontiac—5, 10, 15 and 20 cents—according to the distance the passenger is going. When a passenger pays, say, a 15-cent fare, the conductor can not turn in a 5 or 10-cent fare without the box giving him away. The company is having 860,000 checks printed for the boxes.

Street Car Signs of Two Cities.

THE BOSTON ANNOUNCEMENT.

The following announcement is posted in the Boston street cars:

"The board of health hereby adjudges that the deposit of 'sputum' in street cars is a public nuisance, a source of filth and cause of sickness, and hereby orders that spitting on the floor of any street car be, and hereby is, prohibited."

THE NEW YORK ANNOUNCEMENT.

The following sign appears in the street cars of New York city:

"Spitting on the floor of this car is positively prohibited."

Gotham and the Hub have different ways of arriving at the same statement.

The plant of the Petersburg, Ind., Electric Light Company was blown to pieces the other day, causing a loss of $10,000. No one was injured. The plant is a total loss. One large section of the boiler, weighing several tons, was blown 75 yards, going through a barn filled with baled hay and demolishing the barn. The cause of the disaster is unknown.

ELECTRIC LIGHT FLASHES.

The electric light plant is closed at Carlinville, Mich., owing to no coal being obtainable, and the city streets are in darkness.

The Americus, Ga., Illuminating and Power Company has contracted for a new dynamo and other machinery for its electric light plant.

Work on the new brick power station to be erected at Bar Harbor, Me., for the electric light company will begin at once. About two months will be consumed in completing the structure.

The Consolidated Electric Light and Power Company, of Kansas City, Mo., has brought suit against the Portsmouth Investment Company to recover $1,011.12 for lights furnished during the past year.

The Massachusetts gas commissioners have approved the issue of $15,000 bonds by the Cottage City Gas and Electric Light Company, and $18,000 bonds by the Gardner Gas, Fire and Light Company.

A complete electric lighting plant has been put in by the Hall's Safe and Lock Company, of Cincinnati, Ohio, for the purpose of running at night. The plant is a thoroughly modern and efficient one, and operation by a night force will begin in a few days.

It is reported that the contract for the plant of the San Gabriel, Cal., Electric Light and Power Company, in the San Gabriel canyon, has been let. The tunneling work alone, through rock, is calculated to cost $100,000, while the ditches and pipe line will cost $40,000.

Surveyor Charles J. Peters, of Tiffin, and George and Charles Lott, Carrol Heaton and Conrad Rumple, of McCutchenville, are the incorporators of a new electric light company with a capital stock of $15,000. The company will at once erect an electric light plant at Paulding, Ohio, the county seat of Paulding County, and a 25-year franchise for the use of the streets and alleys of the village for their poles and other equipments has been secured.

A Roentgen Society.

A Roentgen Society has been formed in London, with Prof. S. P. Thompson as the president, says an English contemporary. The intention of the founders is that the society shall occupy a position between those devoted purely to medicine, to physics, or to photography. Some of the members will study the sources of the Roentgen rays, others the applications; some the induction coils, others the tubes and the various forms and adaptations of the apparatus used in the production of the rays. Roentgen photography has been found serviceable in so many branches of scientific investigation that the society appeals to a large constituency for support. It should be the means of increasing the efficiency and applications of the rays, and should also be of assistance to surgeons and others who have entered the new field of work without previous training in physics.

STREET RAILWAY ASSOCIATION OF THE STATE OF NEW YORK.

PROGRAMME OF THE FIFTEENTH CONVENTION.

The fifteenth annual meeting of this association will be held at the International Hotel, Niagara Falls, N. Y., Tuesday and Wednesday, September 14 and 15. The officers of the association are as follows: G. Tracy Rogers, Binghamton, N. Y., president; W. Caryl Ely, Niagara Falls, N. Y., vice-president; John N. Beckley, Rochester, N. Y., vice-president; Henry A. Robinson, New York, secretary and treasurer; G. T. Rogers, H. H. Vreeland, John W. McNamara, Henry M. Watson, Clinton L. Rossiter, H. A. Robinson, executive committee.

The programme of the business meeting has been arranged as below:

Tuesday, September 14, 9.30 A. M., meeting of the executive committee; 10.30 A. M., meeting of the association. Order of business: 1. Call of the roll. 2. Approval of the minutes. 3. Address of the president. 4. Report of the executive committee. 5. Minutes of special meeting of the executive committee. 6. Report of the treasurer. 7. Reading of papers on practical street railroad questions by well known gentlemen; names and subjects to be announced. 8. Discussion ensuing. 9. General business: (I) appointment of nominating committee; a—nominations of officers; b—selection of place of next meeting; (II) election of officers; 5.30 P. M., executive session of the association; 7 P. M., banquet (International Hotel).

Wednesday, September 15, 9.30 A. M., meeting of the association; general business.

The detailed programme of the entertainment proposed is very attractive, as will be seen by a perusal of the following:

FIRST DAY, TUESDAY, SEPTEMBER 14.

Arrangements have been made for a delightful excursion for the ladies to Toronto and return, at reduced rates; 7 P. M., banquet International Hotel.

SECOND DAY, WEDNESDAY, SEPTEMBER 15.

Trip 1: Across the bridge of the Niagara Falls and Clifton Suspension Bridge companies to Canada, thence by special cars over the Niagara Falls Park & River Railway to view the Horseshoe Falls and Rapids, and to Chippawa, and thence to Queenston; thence by the Niagara River Navigation Company's steam ferry to Lewiston, N. Y., returning to Niagara Falls by the Great Gorge Route.

Trip 2: A visit to the plant of the Niagara Falls Hydraulic Power and Manufacturing Company. In this plant the electrical installation is 250 feet below the top of the high bank of the Niagara River. This plant furnishes 6,000 electrical and hydraulic horse-power for lighting, railroad and manufacturing purposes, and is now being enlarged to furnish a total of 16,000 electrical horse-power.

Trip 3: By the cars of the Niagara Falls & Suspension Bridge Railway Company to visit the plant of the Niagara Falls Power Company, where 15,000 electrical and hydraulic horse-power is now being generated for lighting, railway and manufacturing purposes. The enlargement of this plant is now in progress sufficiently to generate a total of 50,000 horse-power. Here, also, may be inspected the machinery from which 1,000 electrical horse-power is now being transmitted to Buffalo for the purposes of the Buffalo Railway Company. This transmission line when completed will transmit 20,000 electrical horse-power.

Trip 4: A visit to the New York State Reservation and Islands, and upon the steamer Maid of the Mist; 9 P. M., grand ball, International Hotel.

On the morning of the 16th, the entire party will be conveyed to Buffalo in special cars of the Buffalo & Niagara Falls Electrical Railway, through the courtesy of that line, the Niagara Falls & Suspension Bridge Railway Company and of the Buffalo Railway Company.

Electric Railway Exhibits Can Be Stored at Niagara Falls.

Wells, Fargo & Company inform the ELECTRICAL REVIEW that all exhibits sent by their express line to the State street railway convention, at Niagara Falls, which meets on September 14, will be stored by them at Niagara Falls until the meeting of the American Street Railway Association, which occurs at the same place in October. The extension of this courtesy, under which storage charges will be avoided, will undoubtedly be appreciated by manufacturers and others who intend to exhibit their products at both conventions.

LITERARY.

"The Problem of the Twentieth Century City" forms the theme of a practical article in the *North American Review* for September, from the pen of the Rev. Josiah Strong, D. D. If the rate of growth from 1880 to 1890 continues, in 1920 the cities of the United States will contain 10,000,000 more than one-half of the population. The city will then control State and nation, and this fact emphasizes the necessity of taking special means to educate city children in the duties of citizenship.

Telephonic Klondikers.

Here's one from Chicago: Five young men, whose objective point is Alaska, will use telephones. When they reach Alaska they will rig up a five-wired telephone. They will then separate, each man taking a wire. As soon as one strikes a lead which gives promise of panning out well, the others can be summoned, and each will be able to locate the find by following the right wire.

The city fathers at Midland, Mich., have been asked to grant a 10-year franchise, giving the exclusive rights for the telephone business in the village, the prices for service to be $15 and $20 per year.

ASSOCIATION OF EDISON ILLUMINATING COMPANIES.

THE MEETING AT NIAGARA FALLS NEXT WEEK.

TO THE EDITOR OF ELECTRICAL REVIEW:

I beg again to call your attention to the meeting of the Association of Edison Illuminating Companies, to be held at Niagara Falls, September 14, 15 and 16.

The convention will be held at the Cataract House, the leading hotel at the Falls. Accommodations for all members can be secured at this house at special rates of $3.50 per day for each person, it being expected that at this rate one person will occupy a single room and two persons a double room. Should one person occupy a double room, the rate will be $5.00 per day. All members having already reserved accommodations through the secretary will receive a ticket direct from the hotel before September 1, giving the number of the room, etc. All members who have not as yet reserved accommodations should communicate at once with the secretary of the association. All members who expect to arrive before the morning of September 14 should communicate this fact to Mr. Greene, of the Cataract House, so that there may be no misunderstanding as to their accommodations, as the secretary has, in all cases, reserved accommodations only for September 14, 15 and 16.

The meetings of the convention will be held in the large ball room of the hotel, which is admirably suited in every way for this purpose. The sessions will be called to order at 10 A. M. each morning, commencing with September 14, and 8 P. M. every evening, ending September 16, the afternoons of the three days being devoted to the entertaining of the representatives, ladies and guests.

The programme of the convention will consist of papers and discussions upon methods of charging for current, construction and practical use of the photometer, as applied to the gas industry, storage batteries, economy in distribution of electrical energy, recent developments in electrical measuring devices, besides reports of various committees and Lamp Testing Bureau.

The entertainments will comprise a visit to the power-house of the Cataract Construction Company, a ride through "The Gorge" on the new electric road, tally-ho ride, etc. A large number of favorable replies to the former notice of the secretary have already assured a very large attendance—in fact, the convention promises to be the most successful one in many years.

Yours very truly,
W. S. BARSTOW, Secretary.
Brooklyn, N. Y., Sept. 1.

This meeting promises to be largely attended and it is expected that a more extensive report of the proceedings than has heretofore been possible will be given to the public. As is well known, the sessions of the Edison conventions are held in secret. The present officers of the association are as follows: President, Samuel Insull, Chicago, Ill.; vice-president, R. R. Bowker, New York, N. Y.; secretary, W. S. Barstow, Brooklyn, N. Y.; treasurer, J. W. Lieb, Jr., New York, N. Y. Executive committee: C. L. Edgar, chairman, Edison Electric Illuminating Company of Boston, 3 Head Place, Boston, Mass.; Alexander Dow, Detroit, Mich.; J. H. Vail, Philadelphia, Pa.; G. R. Stetson, New Bedford, Mass.; A. W. Field, Columbus, Ohio; Samuel Insull (ex-officio), Chicago, Ill.; R. R. Bowker (ex-officio), New York, N. Y.; W. S. Barstow (ex-officio), Brooklyn, N. Y.; J. W. Lieb, Jr., (ex-officio), New York, N. Y.

Armorite Conduit from New York Stock.

Arrangements were completed last week, under which Mr. R. B. Corey, 711 Havemeyer Building, New York city, in addition to his other interests, becomes the New York city representative of the Armorite Interior Conduit Company, of Pittsburgh. A full line of Armorite conduits will be carried in New York, and orders will be filled promptly from stock. There are few better known men in the electrical business than Mr. Corey, and with his acquaintance and experience at their command, the Armorite Interior Conduit Company should get their share of business in the metropolitan district. The unusually large number of new buildings now in process of erection in Greater New York, affords an excellent opportunity for the installation of a conduit possessing the merits of Armorite, and this fact will undoubtedly be taken advantage of, both by the company and by Mr. Corey.

OBITUARY.

Robert C. Shelmerdine, general receiver of the Union Traction Company, of Philadelphia, died suddenly on August 24, at Abington, Montgomery County, Pa., his Summer home. Mr. Shelmerdine was afflicted with heart disease, although otherwise a very robust man. He dropped dead as he was dressing. He was a member of the well known family of that name, being a grandson of the late Dr. Robert C. Shelmerdine. He succeeded his father, Edward K. Shelmerdine, as chief receiver of the People's Passenger Railway Company eight years ago, and became general receiver of the Union company when it was formed. His uncle, William H. Shelmerdine, is a director of the Union Traction Company, and has large street railway interests in Philadelphia and other cities, and another uncle, George C. Shelmerdine, is cashier of the Union Traction Company.

The Central Union Telephone Company last week paid to the City Comptroller, of Indianapolis, Ind., the sum of $3,000, which is the second semi-annual payment to the city under the terms of a new contract.

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Special Notice to Advertisers.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue.

NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

NEW YORK, SEPT. 8, 1897.

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Lord Kelvin writes that he will be in New York *en route* to England about October 1. The electrical fraternity of New York will welcome the opportunity to pay their respects to this most eminent scientist.

We think there is enough engineering talent at the command of the Brooklyn Bridge management to arrange the loop for the trolley cars at the New York end on the street level. The elevator plan, at one time proposed, would prove very unsatisfactory. We believe that President Berri and Chief Engineer Martin will realize this fact before it is too late.

ANNOUNCEMENT OF DATES OF CONVENTIONS.

Association of Edison Illuminating Companies, Cataract House, Niagara Falls, N. Y., September 14, 15 and 16.

Street Railway Association of the State of New York, International Hotel, September 14 and 15.

International Association of Fire and Police Telegraph Superintendents, Maxwell House, Nashville, Tenn., September 14 and 15.

Old Time Telegraphers' Association and U. S. Military Telegraph Corps, Maxwell House, Nashville, Tenn., September 15, 16 and 17.

The American Electro Therapeutic Association, Academy of Medicine, Harrisburg, Pa., September 21, 22 and 23.

National Street Lighting Association, Neil House, Columbus, Ohio, September 28 to October 1.

American Street Railway Association, International Hotel, Niagara Falls, N. Y., October 19, 20, 21 and 22.

The daily papers of New York are publishing interviews with one Geo. B. Pennock relating to his "wonderful" electrical inventions. The electrical work of Pennock has never, to our knowledge, proved of any practical value, and we do not know of one electrical engineer of repute who indorses it. The surprise is that the press of this city, where reliable information is so easily obtained, should give space to the ridiculous claims put forth by this man.

It is an old saying that when the farmer has plenty of money the country is prosperous. The recent rapid advance in the price of wheat will result, according to some authorities, in placing over $100,000,000 in the hands of the farmers of the United States. In many instances the farmers themselves are receiving as high as $1 per bushel for their grain, while cash wheat during the past week has been quoted as high as $1.13. In many farming communities in the West bankers have agreed to extend their business hours until nine o'clock in the evening for the accommodation of the farmers who desire to make deposits after selling their wheat. One of the largest speculators in grain has predicted a price of $1.50 per bushel for wheat before the first of the year. With the impetus that the wave of prosperity has already received, it will take but a very short time for this large sum of money, which will come into the possession of the farmers, to find its way into the channels of all lines of trade, and especially into those connected with manufacturing industries.

THE THIRD RAIL IN CONNECTICUT.

The third-rail electric road between Hartford and New Britain, Ct., is an ever-attractive subject for our friends of the daily press. Some of the recent paragraphs appearing in our esteemed contemporary, the Hartford *Courant*, are presented below, and we are sure they will interest all our readers and compel respect for the descriptive and imaginative faculties of the special third-rail reporter:

That great strip of iron reaching from the power-house at Berlin to the station at New Britain, and again from New Britain to Hartford, is charged with electricity enough to keep all the cars in motion, and many more than do go.

So far, however, it hasn't killed anybody. It did kill a horse whose master drove him between the tracks. The animal fell across both rails and was burned to death.

A young girl fell while crossing the track and lay at once upon the traction rail and the live rail. She was scared and burnt, but her companions pulled her away and now she is as lively and well as any of her friends.

A tramp jumped from a freight train near Sigourney street in this city and sprawled over upon the New England tracks. When he struck the electric rail it threw him right up in the air.

One of the section hands reached across the live rail for an iron tamping rod. When it struck the live rail the electric current ran right through him. He gave a leap or else was thrown down the embankment. He climbed up later, well scared but not hurt. He dropped the tamping bar at the moment of shock and it fell across both rails. In about a minute it was burned in two!

One man, whose leg was touching the third rail, reached over to pick up a bolt. He never picked it up. It picked itself up and jumped right into his hand. This is a fact. When his hand was pretty near the bolt, that bit of metal left the ground and went to meet the hand!

Several large dogs have walked to death by trying to step on the third rail and also on one of the others. When their bodies complete the circuit, there's a squeal and a jump and a dead dog.

There have been two snakes found dead already. One, quite large, undertook to wriggle over while a car was waiting on the side track at Newington, and the passengers witnessed the execution. It squirmed along easily over the first track and then mounted the next with its tail still on the first. Suddenly the snake arched up into the air in graceful shape and then it fell down dead.

During one of the heavy July rains there was water 18 inches deep on the track in one spot for a considerable distance, but the power still stayed in the rail and the car made its trip without inconvenience. There is almost no limit to the speed the third rail can develop. Seventy miles an hour is a rate reached without any difficulty.

Two men have been struck and killed by third-rail cars, which do not turn out any more than steam cars do for people on the track; one pair of horses driven right in front of a car was killed, and also one cow. That is about the record of the cars themselves.

These times are full of opportunity. Be awake!

Mr. Rushmore's Multi-Circuit.

To the Editor of Electrical Review:

I have your favor of the 24th inst. with clipping from the London *Electrical Review* of August 13, in which Mr. Rankin Kennedy states that my multi-circuit is "by no means a novelty to electricians on the other side. That he patented it 15 years ago; that it has since been reinvented and patented by a number of others in England and Germany, and that in all his extensive practice there were only two cases where it could be applied, and hence, although well known, such machines are not in common use."

This is just like those funny Englishmen. They did the whole thing so long ago that they have simply forgotten all about it, and everything that is done in this country is simply reinventing. It is a matter of history that many important American inventions have been first condemned by the scientists of Europe and some time later, when the inventions came into extensive use in spite of their predictions of failure, they explained how it all happened and claimed all the glory to themselves.

Mr. Kennedy hits pretty hard at the examiners in the Patent Offices of England, Germany and France, that they allowed the thing to be patented over again so many times, and that in spite of all these early patents they allowed each and every one of the 16 claims in my last patent without any reference whatever.

It is probable that Mr. Kennedy has not yet grasped the idea involved in my new machine of distributing the current throughout the armature in such a manner that the operation of each section will be entirely independent of the other sections. Many attempts have been made to supply a number of circuits at varying pressures from a single machine by collecting the current under different pairs of poles, and a number of machines have, from time to time, been built, but, like Mr. Kennedy's, they have all failed, as with current equally distributed in the armature the reaction of the loaded section destroys the balance, and the different circuits can not carry widely differing loads.

I now have in operation a good-sized arc machine running two series circuits, each as entirely independent as if supplied from separate machines, and I will soon have running in a large arc station near New York a four-pole machine supplying two circuits of 100 lights each, each circuit automatically regulated from full load to short circuit, and either circuit to be instantly opened or short circuited without in the least affecting the working of the other circuit, whether it be carrying a full load or any portion of a full load. The machine may be constructed in any size desired, and I expect within a year to have in operation direct-connected arc machines supplying six or eight 100-light circuits.

If Mr. Kennedy or any one doubts the practicability of the machine, they are welcome to see the one now running and make any test desired. If they will wait a short time they will see some pretty large machines in commercial use.

Thanking you for calling my attention to the matter, I remain,

Yours truly,

S. W. Rushmore.

Jersey City, N. J., August 31.

The Boston Subway Opened for Traffic.

On Wednesday, September 1, the Boston subway was opened to the public early in the morning. There was no special demonstration in connection with the event except that a great crowd tried to board the first car passing through the subway. This was an open car of the Allston line, which made the trip from the Public Garden gate to Park street in about four minutes. After this, cars passed through at the rate of three to a minute, all heavily laden with passengers. It was estimated that over 100,000 people traveled through the subway during the day up to the time the gates were closed at midnight.

The local authorities are of the opinion that before next Summer the entire subway will be finished, and Tremont street will be entirely freed from street car traffic. At the present time only the Boylston street and Tremont House cars are passing through the subway, but the Shawmut avenue entrance is almost completed and will be in use within a month.

The length of the main line of the subway is one and one-third mile, while the total length is one and one-half mile. Five miles of single track are laid in the subway, which will cost, when finished, about $6,000,000. Work on the subway commenced on March 23, 1895, and will probably be completed by the Spring of 1898. The present capacity of the subway is 90 cars per hour, which will result in carrying 32,000,000 passengers per year.

The height of the subway is 14 feet and the width where two tracks are used is 24 feet. On the four-track sections the width is 48 feet. Over 200 tons of rails and 5,000 ties were used in laying the tracks contained in the subways. There are five underground stations.

The Clocks Ticked Telegrams.

Five stores in Mt. Vernon, N. Y., have synchronized electric clocks operated by wire from the Western Union Telegraph office. The proprietors were startled one morning last week when the gongs began striking intermittently, and the hands flew round and round as if time was no object. A telegraph operator who happened to be in one of the stores pricked up his ears and discovered that the gong was pounding out a message being sent from Greenwich, Ct., to New York city. The storekeepers assembled at the telegraph office and declared that their customers were being driven out by the racket. An investigation revealed the fact that the clock wires were crossed with a regular telegraph wire, and the trouble was soon straightened out.

PERSONAL MENTION.

Mr. S. M. Hamill, of the Brush Electric Company, visited New York city last week.

Mr. Robert W. Blackwell, of London, Eng., is visiting New York city after an absence of several years. He finds many old-time friends in the electrical field ready to warmly greet him.

Mr. John McGhie, of the General Electric Company, has returned from a well deserved vacation on the continent of Europe, where his familiarity with the languages and customs made his trip particularly enjoyable.

Mr. Charles R. Huntley, of the Buffalo General Electric Company, is taking an active interest in the great exposition to be held at Niagara Falls in 1899. Mr. Huntley was present when President McKinley drove the first stake two weeks ago.

Prof. H. T. Bovey, of McGill University, Montreal, was one of the distinguished men of science attending the British Association proceedings at Toronto. Professor Bovey extended a warm Canadian welcome to all his friends from the United States who were present.

Mr. Geo. A. McKinlock, of Chicago, arrived in New York last week and entered into a golf match with Durant Cheever. At last accounts it was thought the game would be finished this week, and these two athletic electricians would be able to take the trolley back to town. Later—Chicago won.

President A. B. Chandler, of the Postal Telegraph Company, occasionally goes hunting in Canada with his friend, Mr. H. P. Dwight, of Toronto, president of the Canadian Telegraph Company. "Camp Chandler" is to be seen in photographic accuracy in Mr. Dwight's office, and was the death scene of several big game.

Mr. Walter S. Andrews, comptroller of the Canadian General Electric Company, Toronto, extended many courtesies to the electrical visitors to his city during the recent meeting of the British Association. He gave a very pleasant Toronto Club luncheon to one of the "outside barbarians," as the Chinese say, which was discussed by President H. P. Dwight, of the Canadian Telegraph Company; General Manager Langton, of the Toronto Street Railway; City Engineer Keating and others.

To Niagara Falls Next Monday.

Quite a party of delegates to the New York State Street Railway Convention, at Niagara Falls next week, will leave Monday evening on the Erie Railroad at 7.25 o'clock from the foot of Chambers street, and arrive at Niagara Falls 8.08 Tuesday morning. Special cars have been provided for the party. Among those who have engaged accommodations are Maj. H. C. Evans, E. J. Lawless, G. S. Allison, W. S. Silver, W. L. Candee, R. H. Beach, W. J. Clark, Geo. M. Haskell, Chas. W. Price, Elmer P. Morris, A. L. Johnson, Frank Randall, E. G. Long and J. H. McGraw.

LATE NEWS.

Hiram Maxim was the first to ride in the electric carriages in London.

The election recently favored issuing $26,000 electric light and water bonds by Monroeville, Ohio.

A receiver has been asked for the Bloomington, Ill., City Railway. It has defaulted on its $100,000 bonds.

The Nassau Electric, of Brooklyn, report for year ending June 30:

Gross, $1,760,560; increase, $1,044,618. Net, $715,196; increase, $439,157.

Elliott Woods, of Washington, D. C., is reported to have found that specially prepared gold foil will, if used as a shield, effectually destroy the injurious effects of the X rays.

It is reported that there will be some unique lighting effects at Niagara Falls during the meeting of the Edison companies. The rapids will be the point of interest in this respect.

The Marconi signaling system without wires has been so strongly boomed that a cablegram from London states that there is a strong suspicion that there is a stock-jobbing scheme back of it.

It is reported that George L. Lusk, City Recorder, West Bay City, Mich., has had papers served on him to restrain city from issuing $20,000 five per cent electric light bonds. These bonds were awarded to Lamprecht & Company, of Cleveland, at 104.625.

The New York & New Jersey Telephone Company has recently been engaged in testing the electrolytic effects of trolley currents in Newark, N. J. From 5 to 10 volts pressure were found between telephone cables and adjacent hydrants. A number of lead-covered cables were found to be badly corroded.

The directors of the Boston "L" Railway have formerly ratified the lease of West End Railway to the "L" company. Only two more steps are required before the "L" company secures control: First action by West End stockholders at special meeting to be held September 9, and approved by Railroad Commissioners.

An injunction has been issued by Judge Tuthill restraining the City Railway, of Chicago, from bringing any new suits against the General Electric Railway Company. Its route parallels the City Railway. Suits were brought, it is claimed, to interfere with financing the new road. The City Railway Company has just declared the usual quarterly dividend of three per cent, payable September 30.

The electrical convention days are fast approaching. Niagara Falls, N. Y., and Nashville, Tenn., will be honored by the assembling of several important organizations.

PROFITABLE EXTENSIONS OF ELECTRICITY SUPPLY STATIONS.

READ BEFORE THE NATIONAL ELECTRIC LIGHT ASSOCIATION, NIAGARA FALLS, N. Y., JUNE, 1897, BY ARTHUR WRIGHT.

(*Continued from page 105.*)

DISCOUNTS ON CONSUMPTION PER LAMP FIXED.

It may be said that all this is very much like thrashing a dead donkey, as many managers have long ago introduced the system of giving discounts in proportion to the number of lamp hours consumed per lamp fixed per annum. However, the author's contention is that, although this is an honest attempt to solve the difficulty, the counting of the lamps and estimating their current-consuming capacity is only applicable to those stations that cater merely for street or similar lighting.

The author maintains that, for anything else than street lighting, this system must have a very pernicious effect on the development and extension of the supply business, for the following reasons:

Firstly, as the discount given is frequently *inversely* as the connected load (a strange method surely of encouraging the public to give a whole-hearted support to electric lighting), a consumer usually installs only those lamps he can use very freely, and, under this scale, the longer he runs them the larger will be his "bounty" in the shape of discounts; as he knows very well that if he fixes any less frequently used lights, his consumption per lamp, and, consequently, the discount given him, will decrease, so he stops short of the number he would like to use, and electric lighting remains for him a luxury strictly confined between the limits of certain business or social requirements.

The economic disadvantage of this method of charging, then, is that it tends to contract the load curve and drive up the peak, which seems to the author fatal to this system. This restriction of the use of electricity must prevent the consumer's individual load curve being broadened out by the use of lamps that, although not used for many hours daily, yet are used at a time when many of the others are extinguished. It is obvious that the more generally a building is wired the more natural is it that a prolonged demand for current from the supply station should result. In domestic lighting and in competition with isolated plant supply, giving discounts only on lamps actually fixed is prohibitive; a domestic supply of light is very imperfect unless it can be had when and where required, and in both of these cases it seldom happens that anything like all the lamps are required to be lighted simultaneously. By this method of discounts, hotels and private residences, which afford probably the most profitable field for electricity supply, would be charged at a rate so high as to prohibit the general wiring of them, although, by their being generally wired, their load curves would be so spread out as to make them highly desirable consumers. This method of giving rebates must also prevent large business establishments from wiring their entire premises, although, probably, the lights would be used in the upper residential parts when those on the lower floors have been extinguished.

The second objection is that in practice the author maintains it is impossible in a large business to ascertain with sufficient accuracy throughout the year the wired capacity of all the consumers' premises. This is patent when we remember the largely varying capacity of lamps, the natural desire and unobjectionable habit of consumers changing the candle-power of their lamps to suit their varying requirements, and the temptation this system offers to fraud; furthermore, it is no more equitable to estimate a consumer's actual demand from his wired capacity than it is to rate a motor at its maximum possible output, irrespective of its actual current requirements.

The third great objection is the inexpediency and great expense of insisting upon the necessary domiciliary visits in all parts of private houses, hotels, etc., which this system requires. These visits are not only highly objectionable, so far as the consumers are concerned, by reason of the intrusion into the privacy of every part of the building, but, from the company's point of view, the expense entailed is very large, as the visits, to be of any use, must be frequent, and the time expended in counting lamps and noting their candle-power is very serious.

In one way or another the public has tolerated a good deal from electrical men—roof fixtures, for example—but the author's own experience has led him to the conviction that the best policy is to give them a good and steady supply on an encouraging tariff, to draw the revenue in due season, and otherwise trouble them as little as possible. The author can not think there is any finality in a tariff which makes it necessary for any one to intrude on the privacy of a man's premises for the purpose of checking his connected load.

Such a system, to put it mildly, leaves room for considerable inconvenience to both parties, and, as we elect to call electrical engineering a tolerably exact science nowadays, I think the time for domiciliary visits has gone by, as we can get all of the necessary figures in the neighborhood of the meter by the use of a suitable instrument.

Finally, no one can pretend to say that there is any real connection between the cost of supplying a large establishment, such as a hotel, and the scheduled number of lamps installed.

Fortunately, there is a much cheaper way of determining the consumers' true demand on the station for supply, consequently the true basis on which the charges should be made; viz., by measuring the greatest rate at which they usually require to be supplied with electricity.

Another system now very much in vogue, but having equally bad effects in preventing the profitable development of supply stations, is the unsound practice of charging a higher price for electricity consumed in lamps than in motors or other current-consuming apparatus, thus implying, for some reason, that the consumer who requires the use of the station generating plant at night should be debited with the whole of the standing charges incidental to keeping this plant ready, although the same plant may be equally used in the daytime to supply another consumer's motor. Surely both of these consumers ought, in common fairness, to share these necessary costs of keeping this plant ready. For a *reductio ad absurdum* of this practice, we have only to compare the relative profitableness of a basement user of lamps with that of an elevator motor, the former being the steadiest and longest consumer any manager can desire to have, and the latter the most objectionable kind of short-time user of electricity.

THE ISOLATED PLANT QUESTION.

In the author's opinion, one of the most profitable fields for extension lies in the displacement of isolated plants, which to-day are frequently a curse to the supply stations by requiring connections to the company's mains as a stand-by against accidents.

This practice forms one of the strongest reasons the author can quote for the necessity of charging each consumer the cost, as nearly as possible, of keeping a proportion of the plant and mains ready to supply him, just as much as it is necessary to make him pay in proportion to the quantity of electricity he consumes. The author maintains that the isolated plant question can, by a judicious tariff, be turned into a blessing, instead of a curse, and his experience leads him to believe that there should be little difficulty in obtaining practically the whole of the profitable part of this business as regular consumers, instead of irregular worries. By no other method than that of an equitable sliding scale can this particular and generally very profitable business be obtained. It is well known that isolated plants are generally only installed where the demand for electricity is of a lengthy nature, consequently they would form a most desirable class of consumers if their permanent supply could only be obtained.

That the result of an equitable sliding scale is to get this class of consumer on a central station supply, is shown in Brighton, England, where, since the sliding scale has been adopted, several valuable isolated plants have been secured to the supply station mains, and not a single new one has been installed in that town,

What is there fundamental in the organism of a central station which should enable it to furnish a block with electrical energy more favorably than can be done by means of an isolated plant? Clearly it is the diversity of the duty which may be performed by the central station.

The cost of a plant supplying a few premises whose requirements make their individual load diagrams pretty closely coincide, must clearly be higher than those of a station catering for a wide variety of demand, and the more diverse this demand in point of time, the greater the output of electrical energy for a given expenditure.

VALUE TO SUPPLY COMPANY OF VARIED CLASSES OF CONSUMERS.

Another excellent method of profitably extending the business of central supply stations is catering for, as much as possible, different classes of consumers requiring electricity at varying hours, and on the same principle encouraging consumers to install lamps that will be used at different times of the day and night. This diverse supply in a town obviously means a much less plant capacity than would be the case were all the lamps required for the same purpose and at the same time. As an illustration it is only necessary to quote the two cases of a large, early-closing store and a theater, or, as applied to the individual consumer, the public rooms and bedrooms of a hotel. In these cases the plant required to supply the store and theater, or the hotel as a whole, would be generally much less than the sum of the requirements of the two classes. In the town of Brighton, where the actual demands of all the consumers are accurately known, and where the use of electricity is very evenly divided between residences and stores, this diversity factor is now no less than one and one-half; or, in other words, if all the Brighton consumers were to require, simultaneously, their ordinary maximum supply (not their wired capacity), the generating plant of the station would have to be increased very nearly 50 per cent.

The consumers have a community of interests in flattening out the station load curve, and they are bound to do it on a tariff that encourages them to wire their premises throughout.

BEST DIRECTIONS FOR ADDITIONAL CAPITAL OUTLAY.

The importance of considering in which direction any additional capital of a supply company can be best spent is also worthy of special study.

In the author's opinion, it is very much more important to run, very soon after the starting of the station, mains in all districts of the town in which artificial light is used late in the evening, although this may be in the districts of the poorer classes of consumers, than it is to spend it on coal-saving refinements, or in running large mains in districts occupied by immense early closing stores or by the mansions of the wealthy; both classes being very enpensive to supply, because of the short daily use made of the plant by the former, and the latter's frequent and lengthy absences from home, or the erratic nature of their demand.

The author would specially point out the true economy of a liberal supply of distributing mains, which can be made to serve the double purpose of supplying the street lamps as well as the general public. In this connection he questions very seriously the wisdom of the practice, resorted to by many central station managers, of running special mains and systems for the sole supply of the public street lamps, as by so doing they needlessly increase the total cost of supplying the whole of the requirements of the district.

The author thinks that insisting on a high initial rate of charge per kilowatt hour, or lamp hour, being maintained to each consumer until the annual cost of getting the plant in readiness to supply his maximum wants has been covered, and then substantially reducing the charge for the subsequent consumption, forms the basis of a perfectly equitable tariff, applicable to all stations and conditions of supply.

(*To be continued.*)

International Association of Fire and Police Telegraph Superintendents.

The annual meeting of this association will be held at the Maxwell House, Nashville, Tenn., on Tuesday and Wednesday, September 14 and 15, and promises to be largely attended. The present officers of the association are as follows: President, Frank C. Mason, Brooklyn, N. Y.; vice-president, Morris W. Mead, Pittsburgh, Pa.; secretary, L. Lemon, Baltimore, Md.; treasurer, Adam Bosch, Newark, N. J.

The entertainment programme includes visits to the Nashville Centennial Exposition, the Belle Meade breeding farm and the summit of Lookout Mountain.

An Interesting Prize Competition.

The Société Industrielle, of Mulhouse, offers eight prizes for the solution of electric engineering problems, says the London *Electrical Engineer*. As foreigners are entitled to compete (in fact, the only men barred are the members of the council and committees of the society itself), we give particulars of the questions, which may be of interest to American competitors. The papers must be sent in before February 15, 1898, addressed to the president of the society, and must be marked with a short device or epigraph; the name and address of competitor is to be forwarded in a separate closed envelope. The problems are numbered as follows: No. 89 refers to an electric motor of variable power and velocity. A medal of honor will be awarded for an electric motor capable of developing power at a speed changeable at will in the ratio of at least 1 to 10, which, when connected to a network of electrical distribution, shall have, according to the various velocities, a minimum efficiency of 20 per cent; the power of the motor at normal speed to be at least 10 horse-power, and at that power and velocity the efficiency must be equal to that of motors working under constant speed. No. 90 is a prize of either a medal or a sum of money for an improved and easily replaceable commutator. This must be applied for six months to an apparatus at work in the province of Upper Alsace. No. 91B is a silver medal for an essay upon lighting a factory; 91 a medal of honor for an essay upon lighting a town of 50,000 inhabitants. No. 92 deals with the electromotive force of alternators. A medal of honor and a prize varying from £20 to £40, according to the merit of the work submitted, will be awarded in this section. This is for a treatise describing the form which the electromotive force curve takes in the single or multiphase alternators, according to the relative disposition of their armature coils and magnet poles. The author must also go into the question whether the curve given by a machine running without a load undergoes modifications of form when it is running with a load, and especially with a load which gives a large lead or lag. This treatise, worked out upon a theoretical basis, should be amplified by experiments made with machines of various types. All particulars which might have an influence upon the electromotive force curve must be given. In conclusion, the author must seek a way to calculate the coefficient which enters into the formula of the effective electromotive force in a manner sufficiently correct to be of use in the construction of alternators. No. 93 is for an electric brake to measure the power.

A medal of honor will be awarded for the design and description of an electric brake capable of measuring 20 horse-power. The cooling should be effected solely by air in contact with the revolving parts. The constructor should make this brake in such a way that the force absorbed by the friction of the air need not be taken into account, being very small in comparison with the power to be measured; but he should at the same time indicate a formula which permits the calculation of the work absorbed by the friction of the air for all speeds at which the brake is capable of acting. He should also furnish the brake with a lever acting in the same direction as the power to be measured, and a weight sliding on the lever, the position of which is graduated empirically in a manner to eliminate the friction of the different speeds. This brake must have been tried by a competent authority, and the results of the trial, as well as a design of the brake, must be attached. No. 94, wattmeter register. A medal of honor is offered for a registering wattmeter. This instrument must be capable of being employed to measure the energy of either a continuous or alternating current in industrial installations. These indications must be independent of the frequency of the alternating currents; its self-induction must be practically nil. It should trace a continuous curve with ink on a sheet of paper, of which the given points are proportionate to the number of true watts which are to be measured. The paper must be moved, thus indicating time.

A Splendid Catalogue.

The Electric Appliance Company, of Chicago, has issued its new general catalogue of electrical supplies, No. 12. The catalogue is a handsome cloth-bound book, 7 by 10 inches in size, and printed on fine wood-cut paper. There are 567 pages and several hundred illustrations. A complete system of trade numbers and telegraphic code words has been supplied for the convenience of customers, and in the back of the catalogue unique provision is made for filing the trade discount sheet.

The experienced buyer will find this catalogue to contain everything that can properly be classed under the head of electrical supplies, as well as a great deal of valuable information. President Low and Treasurer Stacey have certainly reason to be proud of their newest catalogue. With this, the Electric Appliance Company is sending to its customers and friends a complimentary duplicate order book accompanied by self-addressed envelopes. This is a first-rate scheme, and is only one of the many unique ideas evolved by this concern for the comfort and convenience of its many patrons.

The officials of the Iowa Telephone Company report good progress in the construction of the new metallic circuit line from Davenport to Dubuque. This line is one of the branches which will connect with the Long-distance company's trunk line, and was started out about a month ago. The Keokuk-Davenport branch, which has been under way for some time, is nearly completed and will in all probability be in working order this week.

GENERAL NOTES.

The directors of the Boston Elevated Railway Company, on September 2, approved the lease of the West End Railway Company to the Boston Elevated Railway Company and voted to call a meeting of stockholders, September 9, to approve the same.

The gross receipts of the Fairmount Park Transportation Company, of Philadelphia, for August, are officially reported to be $34,908. This is a gain of very nearly 25 per cent over July, as the receipts for that month were previously reported $28,000, in round numbers.

The annual report of the Coney Island & Brooklyn, N. Y., Electric Railway Company shows: Earnings, $337,273; net, $104,596; other income, $2,190; charges, $52,670; dividends, six per cent, $60,000; deficiency for year, $5,882; total surplus, $77,209.

The annual report of the Buffalo, N. Y., Railway Company makes the following showing: Gross earnings, $1,327,088; operating expenses, $668,852; other income, $23,794; fixed charges, $427,123; dividends, $214,820; surplus for year, $40,087; total surplus June 30, $685,833.

The directors of the West End Street Railway Company, of Boston, have called a special meeting of stockholders for September 9. The directors have declared a semi-annual dividend on the common stock of four per cent, payable October 1. Books close September 11 and open September 20. This is an advance of one-half per cent on the regular dividend rate.

A press dispatch from Chicago states that an order for a permanent injunction against the Chicago City Railway Company was entered on the records of the Circuit Court, restraining that company and all its officials, the Santa Fe Railway Company, the Chicago & Western Indiana Railway Company, Henry Brandenburg and several individuals from the instigation of legal proceedings or prosecuting suits now pending against the General Electric Railway Company. President Hawley is quoted as saying that the first result of the injunction would be an almost immediate commencement of the construction.

PERSONAL.

Mr. J. E. Keelyn, president of the Western Telephone Construction Company, of Chicago, who has been spending the Summer with his family in the East, left for home last week.

Mr. E. J. Wessels, general manager of the Standard Air-Brake Company, of New York, returned by the steamship "Lucania," on August 27, after a three months' business trip abroad, during which time he attended the street railway convention in Hamburg.

Mr. Charles E. Bibber, of Boston, was a New York visitor last week. Mr. Bibber is the sole New England agent for the Walker Company, (not the Bibber-White Company as has been stated), and he is vigorously pushing this company's product in the street railway and other branches of the electrical field.

TELEPHONE NEWS AND COMMENT.

The Central New York Telephone and Telegraph Company is introducing party-line service.

The Home Telephone Company, of Fort Wayne, Ind., has appealed to the State Tax Commission for a reduction of its assessment. It was listed at $77,250. It was argued by the representatives of the company that it was a local organization and should be assessed by the county, and not by the State Board.

Emma Vance, of Nashville, Tenn., administratrix of Bose Vance, has entered suit in the Second Circuit Court against the Cumberland Electric Light and Power Company, and the Cumberland Telephone and Telegraph Company to recover $10,000 damages for the death of Vance, who was killed by falling from a pole on Line street.

The Joliet, Ill., City Council has granted a 50-year telephone franchise to Col. John Lambert, a member of the Governor's staff. This franchise will come in competition with the Chicago Telephone Company, which has held the field in Joliet for a great number of years. Colonel Lambert already has the street lighting franchise in Joliet.

The local Bell company, of Suffolk, Va., has just finished laying a cable across the Nansemond River. It was put down in order to furnish the service to two firms, N. R. Withers & Company and G. A. Bozman. The Nansemond Telephone Company has extended its wires to Franklin, which town and Cortland will soon be in close touch with Suffolk on matters of talk.

The Mutual Telephone and Telegraph Company, of Canastota, N. Y., is a thing of the past and will make no effort to establish a local exchange. This state of affairs, it is said, has been brought about by the Central New York Telephone and Telegraph Company reducing the rates to such low figures that there would be no object for the local concern to proceed with the scheme of putting in a system.

The Southern New England Telephone Company is erecting a three-story addition to its present building on Court street in New Haven, Ct. The increasing business of the company has necessitated the addition, which will be used to take care of the overflow. The new building is 26 feet wide, making the total frontage 78 feet. The ground floor will contain a public telephone station in charge of an operator. The floor above will contain the president's and directors' rooms, and the top floor will be turned into additional office rooms for the executive department. The cost of the building will be $12,000, and it will be as fireproof as iron joists and terra-cotta brick partitions can make it.

UTILIZATION OF EXHAUST STEAM.

READ BEFORE THE NORTHWESTERN ELECTRICAL ASSOCIATION, LA CROSSE, WIS., JULY 21, BY GEO. L. THAYER.

In the lowering of prices of our modern industrial enterprises comes the important question of the utilization of the bye products. In some lines manufacturers may be said to make their entire profits from the wastes of a few years ago. You are all familiar with the bye products in gas manufacture, sulphate of ammonia, the analine dyes and others. The large packing houses find a great profit in what the local butcher throws away. In four-fifths of the electric light stations we are wasting a bye product of greater relative value than is the case with any other industrial concern. The exhaust steam carries away 85 per cent of the heat supplied by the boilers. The problem confronting the station manager of the day is this: Can this stream of energy now being wasted be put to some use, and if so will it pay to do it?

This question can hardly be answered off-hand, but I wish to say that, generally speaking, there is no extension of your business that will pay larger profits on the investment than that of steam heating.

The pioneers in central station heating are the American District Steam Company, of Lockport, N. Y., using the Holly system. They were installing plants as early as 1885, using live steam. Commercially the plants were not successful. The installations were what are known as the "gravity system," that is, the movement of the condensed water is controlled by the pitch of the piping. The special fittings of their steam mains are numerous and well designed, the object being to obtain a line of pipe in which the expansion is taken care of and repairs reduced to a minimum. The condensed water from the radiators is not returned to the station, but led into a special radiator, where the remaining available heat is extracted and the water allowed to go to waste.

It was found in the operation of any extensive heating plant, as the buildings of a large factory, that it was very difficult to force steam to the furthest points of the system, even when the piping was carefully designed, without undue back pressure on the engines. Unless the air was removed from the interior of the radiators, the full value of the heating service could not be utilized. When the steam pressure was only a fraction of a pound, the air valves did not readily remove the air.

The circulation could only be improved by going to great expense for enlarged mains.

The first attempt to obviate this difficulty was to put a return valve in the radiators and pump the air and condensed water back to the boiler. In order that one radiator should not short-circuit the entire system the valves were only partially opened.

The engineer used his own judgment as to their adjustment.

In practical operation the method had some drawbacks. The circulation was greatly improved, but the adjustment of valves that was found to be best for mild was not suitable for cold weather. They required constant attention for this reason. Besides, the correct opening for the valve was at best a guess on the part of the engineer. If not enough, the radiator did not get thoroughly hot. If too much, the suction in the return was interfered with and the surplus steam had to be removed by a condensing coil. This was the original vacuum apparatus, the so-called "Williams system."

Since then two rival concerns have obtained patents on improvements and on details. The situation reminds one a little of the incandescent lamp patents five or six years ago.

The real improvement is the substitution of the set valve of the Williams system for an automatic valve which closes as soon as the steam reaches it. The valve is only a modification of the automatic air valve on radiators with which you are all familiar. This valve operates by the difference in expansion between a cylinder of some rubber compound and the metallic body of the valve.

One of these concerns place their valve at the bottom of the radiator and draw both the air and the condensed water through it. It is then pumped into a receiving tank at the boilers, where the air is allowed to escape. The pump exhausts into the general heating system. Because of the forced circulation, the returns are about half the size for an ordinary gravity job. The service pipes, it is claimed, can also be reduced somewhat in size. The other system is usually destined on the lines of a one-pipe job, i. e., the radiator has only one valve for both steam and water. The automatic air valve is placed as usual and connected with a system of return pipes. The air is removed, the condensed water returning to the boiler or reciving tank by gravity, through regular returns. Instead of using a pump, the suction is maintained by means of an injector.

As is apparent, the weak point, if any, is in the thermostatic valve. This, the makers claim, is thoroughly reliable and gives no trouble in operation. It should be remembered that a failure of the valve is a failure of the entire system. The cost of maintaining the vacuum is also an objection, though not serious.

As to operation, there is no doubt that the circulation is practically perfect, the extreme radiators being heated with ease in the coldest weather, steam being circulated at practically atmospheric pressure. With a plain gravity job, no matter how well installed, it is necessary at times to carry five to eight pounds back pressure on the engines. This cuts down the capacity of the engines much more than a corresponding loss of boiler pressure would do. An inspection of an indicator card will make this plain. If on the card a line be drawn representing five pounds back pressure, and a line representing five pounds less than admission pressure, it will be apparent that the area of the card is changed more by the lower line than by the upper. This back pressure also operates unfavorably against the best results with engines which expand down to nearly atmospheric pressure, as compounds and underloaded Corliss engines. It may seem strange, but it is an actual fact that a gravity plant can be changed into a vacuum system and the coal consumption reduced considerably, and that, too, with better results in heating.

When the boiler feed water is of a bad quality it will pay to return the water of condensation. Where a good grade of cylinder oil is used there will be no difficulty with the very small amount of oil coming from the heating system. There will be enough fresh feed water added to prevent any trouble which would come from using distilled water in the boilers. It is needless to say that corrosion and scaling, with their attendant expense, will be largely reduced. However, the loss through wasting the condensed water is not as great as may seem at first. The condensation can be led into an indirect radiator and used to heat the fresh air from outside. The water leaving the coil will have all available heat removed. If, on the other hand, the condensation at 212 degrees be returned to the boiler, the radiation loss in the returns may be more than the heat wasted when the water is discharged from the system.

The correct design and construction of the underground mains is a vital point if the system is to be made a success. It is necessary to secure three results. The radiation losses must be small; unless the distance run is excessive they should fall within five per cent of the total system supplied. Expansion and contraction should be provided for. Assuming a range in temperature from 50 degrees to 212 degrees, 100 feet of main will expand one and three-eighths inches. In a long line of pipe this becomes a serious matter. The main should be protected from surface water, as the pipes are soon corroded through when the pipe covering becomes damp. One standard method of construction is as follows: At the bottom of the trench is laid a tile drain. Pine logs are bored and the outside surface painted with asphaltum. These are tenoned together and the iron pipe, having received its covering, is placed inside. Expansion is provided for by a special fitting having a flexible diaphragm, doing away with a stuffing box. Service connections are made every 50 feet. The work is simplified by there being no return pipe. Another method which seems to be successful is to build a box of tarred boards. The pipes are supported a few inches above the bottom of the box to protect them from water which may accumulate at the bottom.

The box is filled with asbestos wool, or each pipe is covered with common pipe-covering. Expansion is provided for either by expansion joints placed in manholes, or where the pipe is small, by U-shaped offset loops. Whatever method is followed, it pays in the long run to have the work well done.

I am indebted to Prof. R. C. Carpenter, of Cornell University, for the following data on condensation in steam pipes: The various university buildings are heated from one boiler-plant through underground mains. The pipes are laid in a solid log bored two inches larger than the pipe. The thickness of the wood remaining is four inches. The logs were painted on the outside with coal tar and sawdust. There is in the system 150 feet 10-inch pipe and 2,050 feet 6-inch pipe, having a total heating surface of 5,605 square feet. The temperature difference was 235 degrees. Twenty-seven horse-power of return steam was required to supply condensation—i. e., one horse-power loss for each 820 feet of 6-inch pipe, or its equivalent surface—one horse-power being taken as 30 pounds steam at 70 pounds pressure, with feed-water at 100 degrees. In a more technical form the heat loss was .614 Board of Trade units per square foot for each degree difference in temperature. With what is considered good practice at the present time the radiator losses can be reduced to 40 per cent of these figures.

There is no hard and fast rule for the proportioning of radiating surface. Of two buildings of the same construction apparently, one will be warm and the other cold.

The number of leaks, the exposure, and a host of smaller items will make the best of rules more or less in error of radiating surface. The old plan was to allow one square foot of radiating surface to a certain number of cubic feet of contents. A northwest-corner room would take about 1 to 30, the great run of rooms 40 to 60, and large rooms 1 to 100. Stairways and halls were simply guessed at. If a room was hard to warm the fault was laid at some other door than the lack of sufficient heating surface. In private residence work the general circulation of air from room to room evened things up. It was simply pretty good guesswork.

The formulæ given in text-books are quite complex and involve considerable labor. Contractors who do figure by exposures use simpler, though less accurate, formulæ, making such modifications in particular cases as their experience suggests. The method used by a firm in the West, which gave good results with a minimum of work, is as follows: The glass surface was figured first, taking total opening of window frame to allow for leakage. The exposed walls were figured and reduced to equivalent window surface. For unfurred brick or stone walls 15 inches thick, four square feet was taken as the equivalent of one square foot of glass. For ordinary wooden dwellings and furred brick walls the ratio was one to six. Extra warm construction was one to eight. For Northern Illinois the required heating surface was one square foot for two square feet of glass. Rooms exposed to northwest winds the radiator surface was increased 10 to 15 per cent. Any unusual conditions were allowed for as experience suggested. Radiator was proportioned to maintain 70 per cent inside with 0 degree weather outside.

The rates and methods of charging for central station heating vary considerably. There is a tendency to charge according to the space to be warmed rather than by the square foot of radiation. For a store 20 by 80 by 14 the charge for heating is about $60. The radiating surface required is in the neighborhood of 250 square feet, or 25 cents per square foot heating surface per year. Such a store will use five to seven tons of hard coal in an ordinary winter. At $7.50 per ton, it will cost $45 to $50 per year for heating.

You are selling heat practically in competition with hard coal and the rates you are able to secure will be based on that method of heating. In the territory covered by this association you ought to get from 10 per cent to 20 per cent more than the cost with hard coal. You can offer a much better manner of heating but with the disadvantage of the cost of the radiators and piping. The following are some examples of rates:

Plant 1.	Store room	20x90-100	$60 $70
	Office	15x20	20 25
		20x20	
	Bank	20x30	40 50
		20x50	
Plant 2.	Store	22x60	50
		22x75	62.50

Plant 3. $15 per 100 feet per year, or $2 per 1,000 cubic feet in brick stores; $3.50 per 1,000 cubic feet in dwellings.
Plant 4. $100, $125 for 10-room house.
Plant 5. $0.25 per square foot per year.
Plant 6. $3.50 per 1,000 cubic feet. Heating done by live steam on meter.

As yet there is no meter on the market except that of the American District Steam Company, which is used only on their plants. There is no reason why a reliable meter should not be placed on the general market as soon as there is a demand for it.

The cost of operation, outside of interest and depreciation charges, will naturally vary greatly in different plants. It should be borne in mind that your profit lies in selling exhaust steam rather than live steam. An increase in business beyond a cer-

tain point may not pay if fuel is high and the heating rates are low.

One foot of radiating surface will condense one-third pound of steam per hour. Assuming that five and one-half months' steady heating will be the equivalent work for one season, coal at $2 per ton, of an evaporation power of seven pounds, the fuel cost will be 19 cents. If the revenue from one foot will be 25 cents, it will probably be found that business does not yield any profit. In the stations of towns of less than 15,000 inhabitants 75 per cent of the maximum evening load will be carried for five hours during the heating season. Outside of these hours the load will run about 30 per cent for the remainder of the lighting hours. The day power load, if any, will hardly exceed the all-night load. The conditions will be that the first floor 30 per cent of heating business can be done with exhaust steam for at least 14 hours per day. The fuel cost of live steam furnished will be 11 cents per square foot. Another 45 per cent can be supplied with exhaust steam five hours per day at a fuel cost of 15 cents per season. This would indicate that the profitable heating is that which can be taken care of during the greater part of the evening load. Cost of fuel will determine in each case whether new business will pay on a live steam basis.

Some modifications of central station design will follow when steam heating is added. The boiler portion of the plant becomes of much greater importance. Wastes which otherwise would be small assume greater importance when the work done by the boilers is more than doubled. Every effort should be made to bring them up to the highest efficiency. The installation of auxiliary devices, as "Green's Economizer," will sometimes be advisable.

It is evident that the value of a condenser is lessened to a plant, for its use will be confined to the Summer months. As so many stations have high-speed, simple engines not adapted to working condensing, this question need not be discussed.

The use of storage batteries in connection with a heating plant assumes a new importance. It can safely be assumed that during the hump of the load more steam will be used by the engines than can be discharged into the heating system. A storage battery can be used to take a portion of the load during the time. Later in the night, when the heating must be done in part with live steam, it can be charged at a very small expense for fuel. Assuming boiler pressure 100 pounds and temperature of water from heating system at 180 degrees, one pound of steam entering the engine becomes nine pounds at exhaust by adiabatic expansion, a loss of 10 per cent. The steam, at atmospheric pressure and weight for weight, as compared with steam at boiler pressure, contains four per cent less heat. There will be available then 86 per cent of the heat entering the engine. Engine friction and the loss by external condensation remain practically constant. Internal cylinder condensation is slightly less with the added load. Approximately, the battery can be charged with 15 per cent of the fuel required under ordinary conditions. When conditions are suitable there will be a marked gain by their use.

In alternating plants it will be necessary to provide a direct-current load during the heavy lighting hours if batteries are put to this use. A power load would probably be quite small after 6 P. M. Long-burning arc lamps could be installed very successfully in this connection. In this case a good construction would be made with a 220-volt power current and a three-wire system for the arc lamps. Close regulation not being necessary, considerable complication, due to cells and boosters, could be avoided.

The generator might, in some cases, be used as a motor during the heavy lighting load, in the absence of an arc light or power load for the batteries.

To offset these advantages is the high cost of the battery and unwillingness of the smaller stations to make large increase in their investment for the sake of economical operation.

Once a heating system is in operation, it becomes a much easier matter to secure paying power or day lighting load. During the heating season the machinery can be run at a small additional expense; the principal items will be oil and the increased wear and tear. With the coming of the warm months, a respectable fan motor business can be worked up, which will tide over the Summer months, when the station must be run daytime for power alone.

The trend of central station practice seems to be along the lines of extending the hours for the use of its output. The ideal station should be a dealer in light, heat, power, and, if necessary, artificial refrigation. As long as the station confines itself to light, with power as a side issue, so long will the interest and depreciation eat into its earnings.

Independent Telephone Troubles in Baltimore.

A press dispatch from Baltimore, Md., under date of August 31, states that in the suit of George B. Baker, in Circuit Court No. 2, Judge Stockbridge issued an order that an absconding debtor's attachment be issued for William J. Atkinson, late general manager of the Home Telephone Company, and laid in the hands of James Russell and Jacob S. Rosenthal, receivers for the Best Telephone Company. Mr. Baker claims that Atkinson owes $5,000 on two promissory notes made August 26, 1897.

By suit of Mr. Atkinson, who claims to be a judgment creditor, the Best Telephone Manufacturing Company was placed in the hands of receivers. The object of the present attachment sued out in the Superior Court is to catch any interest of Atkinson in the Best Telephone Company, now in the hands of receivers.

The Best company furnishes the instruments used by the Home Telephone Company.

American Type Telegraph Company Attached.

The sheriff received an attachment on September 2 against the American Type Telegraph Company, of 670 Hudson street and 66 Broadway, New York city, for $7,895 in favor of William Lynde Harrison on two notes of the company. It is a New Jersey corporation organized in 1890, with a capital stock of $600,000, and H. P. Hussey was president.

The National Street Lighting Association.

The second annual meeting of this association will be held at Columbus, Ohio, from September 28 to October 1. Addresses on street lighting problems will be delivered, and an exhibition of lighting apparatus will probably be held.

Another Safe Succumbs to the Electric Arc.

TO THE EDITOR OF ELECTRICAL REVIEW:

I recently finished another interesting experiment on a cast chilled iron safe. I brought the positive wire of

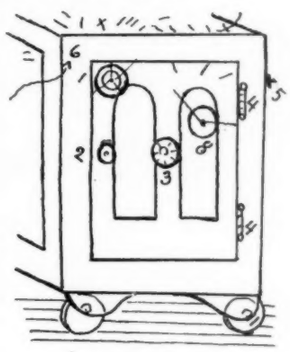

FIG. 1.—DIAGRAM OF SAFE CONNECTIONS AS DESCRIBED BY MR. HOWARD.

an Edison three-wire circuit to the foot or wheel of the safe (see sketch). The figure 7 is the wire around wheel; 8 is the opposite pole, with one-inch carbon attached; 2 is the knob, 3 is dial of lock. The hole at 8 was burned entirely through in 20 minutes in presence of witnesses. We used 110 volts and 80 amperes. In five minutes the safe cracked at 8 (see lines running in two directions). This was done by the "arc wedge" the tremendous heat at this point expanded the metal so rapidly in a radius of three inches that it split or burst the surrounding metal, and I infer from this that it would split any cast safe under similar circumstances. I send you a photograph of the safe.

Yours truly,

JAS. H. HOWARD.

Boston, August 31.

FIG. 2.—VIEW OF SAFE AFTER ELECTRIC ARC WAS APPLIED.

WESTERN NOTES.

The demand for the new catalogue of the Farr Telephone and Construction Company has been so great that the company is making preparations to issue a second edition. Much valuable telephone data are included between the red covers of this little book.

Among the more prominent Chicago visitors noted last week were Prof. S. H. Short, of the Walker Company; Mr. G. G. Luthy, of Peoria, and Mr. W. D. Packard, Warren, Ohio, who was the guest of Mr. F. S. Terry at the Union League Club.

Mr. H. H. Hornsby, for some years chief inspector for the electrical department of the city of Chicago, has resigned, in order to accept a more lucrative position with the Western Electric Company, which is to be congratulated on securing the services of such an energetic and efficient salesman as Mr. Hornsby.

"Just as good as Okonite" is often heard by the purchaser of wires or cables when in search of something standard, according to Mr. Burton, of the Central Electric Company. It is the same old story. Whenever an article has stood the test of time and has proved itself to be in the front rank, imitations are springing up, and one hears expressions like "just as good as a Steinway," "just as good as Pears'," "just as popular as the REVIEW," "just as good as Okonite," but—they seldom are.

The Bullock Electric Manufacturing Company, of Cincinnati, have closed several important orders for generator and motor equipments through the efforts of their Chicago representative, Mr. A. Shillinglaw. Among the several contracts was a good sized order from the Armour Packing Company, at Omaha, for two 200-kilowatt and one 150-kilowatt generators with a complete line of motors. The Chicago *Journal* has also ordered an additional outfit for one of their Gauss presses, all of which would seem to indicate that local power users are fast becoming acquainted with the excellent quality of Bullock apparatus. C. E. K.

Old Time Telegraphers.

The seventeenth reunion of the Old Time Telegraphers' Association and the United States Military Telegraph Corps will take place at Nashville, Tenn., on September 15, 16 and 17. The headquarters will be at the Maxwell House.

News of General Interest.

There will be 40,000 homes cleared of mortgages this Fall in Kansas. Mortgages will average $1,000 each, which means an expenditure of $40,000,000. Wheat and corn are doing it.

ADVANCE INFORMATION

New Electric Railways.

BALTIMORE, MD.—The Baltimore, North Point & Bear Creek Electric Railway Company has been incorporated by Daniel Teller, Samuel Greenwald, Sr., John T. Smith, Henry G. Bready and Robert H. Carr, Jr., to construct an electric line to Bear Creek. Capital stock, $300,000.

ALEXANDRIA, VA.—Captain Randall, proprietor of River View, it is stated, will run an electric railway from Washington to his resort. It is expected that the line will be completed and in operation by next April.

WEBSTER, MASS.—Town Treasurer Oscar Shumway may give information concerning construction of electric railway, for which $25,000 has been subscribed.

HOUSTON, TEX.—Town Clerk may give information concerning electric street railway at Etta.

ELROY, WIS.—The people of Hillsboro have raised $15,000 to construct an electric line between that place and Union Center. It will be given as a bonus. The distance is nearly five miles.

VALDOSTA, GA.—A company has been organized here to build a street railroad from the Georgia Southern Railroad to Pine Park. The road is to go up Hill avenue to Patterson, and thence to the park, a mile out to the north of the city. Work will be commenced on the enterprise as soon as the material can be ordered, and it is expected that cars will be running by November 1. The enterprise is backed up by the most prominent business men of the city.

UTICA, N. Y.—The subject of extending an electric railroad through New York Mills to Clinton is being agitated and talked about between those two points.

SCHENECTADY, N. Y.—There is a survey in progress for an electric railroad from the Ballston terminal track at West Milton, through Galway, West Galway and Hagaman to Amsterdam.

WILMINGTON, PA.—The Wilmington & Elsmere Electric Railway will be constructed and in operation in a few weeks. The line will start from Baltimore and Western avenues in Elsmere, and come to Northern avenue, and then follow it along the west side of the B. & O. Railroad to the new road, or the continuation of Front street. At Silverbrook the line will connect with the Wilmington City Railway for all points in the city.

PENN YAN, N. Y.—It is believed that the construction of the electric railroad from Savona to this place, via Kenka, is practically assured, and that the construction will be commenced in the near future.

PHILADELPHIA, PA.—A movement is on foot to extend the trolley line from Plymouth Meeting to Ambler, a distance of about five miles. At Harmonville connection will be made with the Schuylkill Valley line, and at Hickorytown with the Chestnut Hill line. An effort will be made to secure the right of way along the turnpike.

PUEBLO, COLO.—A new electric line is to be built at this place, connecting with Riverview Cemetery.

INDIANAPOLIS, IND.—A movement is on foot to build an electric road from this place to Plainfield. W. E. Stevenson is at the head of a company of capitalists who are taking the necessary steps for building the road. It will cost about $200,000, including the plant for furnishing the power.

KINGSTON, ONT.—New York and Schenectady capitalists are considering the construction of an electric railway on Willis Island to connect Thousand Island Park, Fine View and Westminster Park. The distance is seven miles.

BATTLE CREEK, MICH.—The long-talked of electric road between this city and Gull Lake and Kalamazoo is an assured fact. The entire right of way between this city and Gull Lake and Kalamazoo has been secured, and it is announced that the contract for the grading has been let to Thomas Dempsey.

SANDUSKY, OHIO—It is reported that a scheme is on foot to build an electric railroad from this place to Lorain, and that Thos. Wood, until recently superintendent of the S., M. & N., is the promoter of the idea.

WARSAW, IND.—A franchise has been granted to Messrs. James Lillie & Company, of Kankakee, Ill., to construct an electric street railway in this city and to Winona Park. If the right of way along the public highway can be secured from the County Commissioners this line will be extended to Vawter's Park, on Lake Wawasee. It is to be completed and in operation by May 1 next.

Electric Light and Power.

SAN FRANCISCO, CAL.—The Central Light and Power Company has been incorporated.

The directors are Frank Pauson, C. L. Ackerman, Joseph Naphtaly, A. E. Brook Ridley, Joseph M. Loewe, Samson Gerst, J. W. Pauson. The capital stock is $1,000,000, divided into 100,000 shares.

LA CROSSE, WIS.—Articles of incorporation of the Twin City Electric Company have been placed on record at Centralia. The capital stock is $15,000.

NEW ULM, MINN.—The Eagle Mill Company has completed a new power plant at a cost of $20,000. The engine is the largest used in any mill in the State outside of Duluth.

PARK RAPIDS, MINN.—Work has been commenced on the electric light plant, and it is expected that the system will be in use by September 15.

BIRMINGHAM, ALA.—Citizens of the place are negotiating for the purchase of the Greensboro waterworks, and if the trade is made the purchasers will erect an electric light plant and probably an ice factory.

ARMADA, MICH.—The village has entered into a contract with O. Drake & Son to light the village with electric lights.

LANSINGBURG, N. Y.—The contract for furnishing a 300-horse-power boiler for the Beacon Electric Company has been awarded to the Robert Wetherell Company, of Chester, Pa. Negotiations are pending for the purchase of a 2,000-light dynamo by the company. The electric plant will commence day operations October 1. S. Bolton's Sons have contracted for a 10-horse-power motor for operating the machinery in the firm's malt house.

LIBERTY, N. Y.—Liberty Light and Power Company, of Sullivan County, has been incorporated. Capital, $25,000; directors, Van Wyck Rossiter, of Brooklyn; Frank McGovern, of New York city; Isaac M. Sutton, of Flushing; H. Hobart Porter, Jr., of Lawrence, and J. H. Sharpe, of Liberty.

GARDINER, ME.—The Kennebec Heat and Light Company contemplate making extensive improvements in its plant here.

SALT LAKE, UTAH—A new electrical plant is being erected at the Chainman mine at Lane City, eastern Nevada, bought some time ago by C. D. Lane, D. L. Bliss and others.

DECATUR, ALA.—City Clerk may give information concerning establishment of electric light plant.

PADUCAH, KY. — The People's Light and Power Railway Company has been incorporated with a capital of $50,000, with G. C. Wallace and W. F. Paston as incorporators.

PHILADELPHIA, PA.—Active preparations are being made for the installation of the new electric light plant at North Wales. The streets will be lighted and current will be supplied to private parties.

HARTFORD, WIS.—A franchise for 10 years has been granted to the Hartford Plow Works for the exclusive erection of poles, stringing of wires on streets, etc., necessary for the operation of an electric light plant. Work will be begun at once, and by January 1 Hartford will have a complete system of electric lights.

UTICA, N. Y.—The Utica Electrical Manufacturing Supply Company has been awarded the contract for wiring St. Peter's Church at Rome for electric lighting. The contract includes a fine switchboard and a magnificent chandelier. The equipment embraces over 500 lights.

SAN JACINTO, CAL. — Electric lights are to be established here.

LEE, MASS.—J. M. Klengelsmith has purchased the Chatham electric light plant.

WOLCOTT, VT.—Hardwick is putting in an electric plant on the falls of the Lamoille River, about a mile above this village.

DEVIL'S LAKE, N. D.—A franchise for electric lights has been granted to Allan Tompkins, of Minot, who will put in the plant at once.

New Telephone and Telegraph Companies.

EASTMAN, GA.—A telephone exchange will probably be established shortly. For further information address the Eastman Electric Light and Telephone Company, incorporated, with William N. Lietch, president; Walter M. Clements, secretary-treasurer.

GADSDEN, ALA.—R. L. Adams, president of the Alabama & Georgia Long-Distance Telephone Company, will make surveys for a long-distance system at this place.

HOUMA, LA. — Emile Daigle is constructing a telephone system.

OZONE PARK, N. Y.—The Ozone Park Telephone Company has been incorporated by James A. Pietsch, J. Victor Hart, O. W. Chevalier, William A. Jephson, Edward K. Pietsch, Herman Pietsch and Thomas F. Hylan, to operate a telephone system in the villages within the town of Jamaica. Capital stock, $5,000.

EAU CLAIRE, WIS.—The Wisconsin Valley Telephone Company has been incorporated, with a capital stock of $200,000.

EAU CLAIRE, WIS. — The Eau Claire Telephone Company has been incorporated, with a capital stock of $100,000.

CHARLESTON, GA. — Arrangements are being made by the Bell Telephone Company to put in a long-distance telephone between this place and Augusta. This connection will put Charleston in close communication with Atlanta, Macon, Mobile, Birmingham, Columbus, as Augusta has telephone connections with the above named places.

SHIPPACK, PA. — The Keystone Telephone Company proposes to extend its poles from this place to points on the North Penn Railroad, including the towns from Perkasie south to Ambler.

PORTSMOUTH, OHIO—The long-distance telephone line, via Jackson, Ohio, is about completed and public stations will be established at once.

WARSAW, N. Y.—The new telephone line connecting Pike with Portage, Hunts and Nunda is completed and in working order.

COLOMA, MICH.—The Twin City telephone line to Coloma and Paw Paw Lake will be completed in a few days.

New Incorporations.

PORTLAND, ME.—The Windmill Light and Power Company has been organized for the purpose of manufacturing and dealing in electrical apparatus for furnishing light and power by means of windmill, etc., with $200,000 capital stock, of which $300 is paid in. The officers are: President, J. J. Feeley, of Walpole, Mass., treasurer, John B. Rooney, of Walpole, Mass.

NEW YORK, N. Y.—The Lightweight Electro Company has been incorporated. Capital, $1,000. Directors: Sigmund Borgzinner, of 82 Nassau street, and Albert Borgzinner, of New York city, and A. F. Crawford, of Mt. Vernon.

FORREST CITY, ARK.—The St. Francis Electric Company has been incorporated. P. H. Thompson, D. C. Webb, I. S. Archer and C. C. White are the incorporators. The company's capital stock is $8,000.

Kindred.... ...Interests

The Joseph Dixon Crucible Company, Jersey City, N. J., has issued its usual monthly calendar blotter carrying a design appropriate to the season.

The Mason Electric Equipment Company, Fisher Building, Chicago, is sending out descriptive circulars of a number of valuable electric railway construction specialties.

The Windmill Light and Power Company, Walpole, Mass., has issued an illustrated catalogue describing its complete windmill systems for supplying electric light to suburban or isolated residences.

The Carlisle & Finch Company, 828-830 West Sixth street, Cincinnati, Ohio, has succeeded to the business of Carlisle & Finch, manufacturers of searchlights, electric headlights, focusing lamps and electrical specialties.

The Hatch Storage Battery Company, of Boston, has issued a descriptive illustrated catalogue of the improved Hatch accumulator. The catalogue also contains an opinion from Mr. Causten Browne, the well known patent attorney, to the effect that the Hatch patents do not infringe the Brush patent No. 337,299.

Walter C. McKinlock, 1108 Fort Dearborn Building, Chicago, although but recently started, has closed some very good-sized contracts for rubber-covered wire and incandescent lamps. Mr. McKinlock is handling the Merritt Electric Company's products, who are manufacturers and renewers of electric lamps. A new lamp is practically made from a burnt-out one, and as a new and superior filament and a new vacuum are the only essential things, there is no good reason why every lamp user should not renew his lamp. The factory that Mr. McKinlock represents can refill and return lamps within three days.

The calendar of the Lake Shore & Michigan Southern Railway is a particularly striking and handsome production. The centerpiece in colors is a large illustration of a mail bag, the vast mail service of this great railway having warranted a reputation second only to its record for an immense and always satisfied passenger traffic. The motive power of the Lake Shore is modern in every detail, and this, with its magnificent and carefully kept roadbed, makes it an ideal passenger line, touching the great cities of Buffalo, Cleveland, Toledo, Sandusky and Chicago. It passes through one of the most productive and influential sections of the United States and is a model railroad.

The Standard Air-Brake Company, of New York city, have just close da contract for 60 air brakes for one of the colonies. In addition to this they have also closed a further contract for 15 complete air-brake outfits, as well as several for some of the continental cities. While General Manager Wessels, of the Standard Air-Brake Company, was abroad, he appointed the following additional agents: Messrs. Dick, Kerr & Company, Limited, the well known tramway supply people, at 101 Leadenhall street, London, E. C., who will hereafter be the sole agents for the Standard Air-Brake Company for the United Kingdom. Also Messrs. E. H. Cadiot & Company, 12 Rue St. Georges, Paris, who have acquired the Standard Air-Brake Company's agency for France. It is expected that a good business will follow these appointments. The Bersche-Stahl Industrie, of Berlin, who represent the Standard Air-Brake Company on the Continent, have already inaugurated a very good business in air brakes.

BRAZING GRAPHITE.

Not a little of the expense in brazing is due to the cost of removing the brass which has stuck to the metal where it is not wanted. The removal of this brass is usually attained only by patience and diligent filing. Now comes to the aid of the brazier that unique mineral, graphite, which is not affected by acids, alkalies, heat or cold. Braziers who have made use of Dixon's Pure Flour of Graphite pronounce it worth its weight in gold. A sample will be sent without charge by the Joseph Dixon Crucible Company, Jersey City, N. J., who are the only manufacturers.

BIDS WANTED FOR ELECTRIC LIGHTING

ASHEVILLE, N. C., Aug. 12.

Bids for lighting our city are requested as follows:

For furnishing and maintaining one hundred to one hundred and fifty electric arc lights of two thousand (2,000) candle-power each.

The city reserves the right to reject any or all bids.

Bids to be received until September 20, 1897.

GEO. F. SCOTT,
Chairman Special Light Committee.

The Mayor and Gas Committee will receive bids to light the City of Waco, on an all-night and also on a moonlight schedule, with 125 to 200 arc lights, 2,000 c.-p., for a term of two to five years. We will also receive bids to install an electric light plant, specifications for which will be furnished by City Engineer on demand. All bids must be accompanied by a $1,000 certified check. We reserve the right to reject any or all bids. The bids will be opened by the Mayor and Gas Committee at 3 P. M., October 7th, 1897.

C. C. MCCULLOCH,
Mayor, Waco, Texas.

ATTEST:
R. W. JOBLONOWSKI,
City Secretary.

A NEW THROUGH PASSENGER ROUTE
FOR COLORADO, UTAH AND CALIFORNIA.

The Chicago *Times-Herald* of August 27 says that on September 12 the new traffic alliance between the Chicago, Milwaukee & St. Paul Railway and the Chicago, Rock Island & Pacific Railway goes into effect, and on that date the former will send its first Denver sleeper out of Chicago. This will be attached to its regular night train for Omaha, and will be delivered there to the Rock Island. On October 2 the tourist car route over these two lines, the Colorado Midland and Southern Pacific, will be inaugurated. Tourist cars will be run once a week between Chicago and San Francisco. For further details regarding this new route call on or address Geo. H. Heafford, general passenger and ticket agent, C., M. & St. P. Ry., 410 Old Colony Building, Chicago, Ill.

NOTICE TO BIDDERS.

Notice is hereby given that bids will be received by the Common Council of the City of Niagara Falls up to and including the first day of November, 1897, at 8 o'clock P. M., for the exclusive furnishing of electric arc lights to the City of Niagara Falls for a period of five years from November 1st, 1898, according to specifications on file with the City Clerk.

Each bid shall give the name and address of the bidder, and shall state the price per annum, for which the bidder will furnish each electric arc light of a two thousand (2,000) candle-lamp-power for said term.

The estimated number of arc lights to be furnished is three hundred (300), with the right of the Common Council of the said city to increase or decrease the said number as it may elect during said term.

The successful bidder will be required to enter into contract for the furnishing of said number of electric arc lights as may be required for such term at the price per annum named in its bid and to furnish bond in twenty thousand dollars ($20,000.00) for the faithful performance of said contract.

Each bidder must accompany his bid with a certified check for ten thousand dollars ($10,000.00) as a guarantee that he will enter into contract if the same is awarded to him.

Further information, if desired, will be furnished by the City Clerk upon application.

All bids shall be opened at the meeting of the Common Council, to be held Monday, November 1, 1897.

The Common Council reserves the right to reject any or all bids.

Dated August 16, 1897.

By order of the Common Council.
S. F. ARKUSH, *City Clerk.*

McCASKEY & HOLCOMB COMPANY,
CONTRACTORS
SPRINGFIELD, ILL.
415 COMMERCIAL BLDG., ST. LOUIS, MO.
We make a specialty of constructing Municipal Electric Lighting Plants.
Send for Estimates and Valuable Information.

ROYCE & MAREAN,
DEALERS IN
Electrical Supplies,
WASHINGTON, D. C.

W. R. OSTRANDER & CO.
22 DEY STREET,
Manufacturers of
SPEAKING TUBES, WHISTLES, ANNUNCIATORS.
Electric and Mechanical Bells.
FACTORY,
DE KALB AVENUE,
BROOKLYN.
Send for Illustrated Catalogue.

Modern Telephony
MEANS.....
METALLIC CIRCUITS
MESSAGE RATES
MODERATE CHARGES
New York Telephone Co.,
15 DEY ST.
18 CORTLANDT ST.
952 BROADWAY. (23d St.)
113 WEST 38TH ST.
NEW YORK CITY.

STEAM ENGINEERING
(Stationary, Locomotive, Marine); Mechanical Drawing; Architectural Drawing; Machine Design; Electricity; Architecture; Plumbing; Railroad, Municipal, & Bridge Engineering; Surveying and Mapping; Metal Pattern Cutting; Bookkeeping; Shorthand; English Branches; Mining; Metal Prospect'g. All who study GUARANTEED SUCCESS.
31 COURSES
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Circular Free; State subject you wish to study.
International Correspondence Schools, Box 1003, Scranton, Pa.
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THIS CO HAS BEEN MAKING
TELEPHONES
20 YEARS, NOT CHEAP BUT SERVICEABLE AND FULLY GUARANTEED.
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BALTIMORE, MD., U. S. A.

THOMAS HILL, Jr.,
Experimental Electrical Work
AND
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REPAIRING IN ALL ITS BRANCHES.
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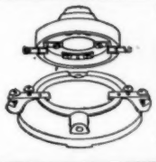

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[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED AUGUST 31, 1897.

588,965 Municipal signal system; H. F. Eaton, Cambridge, Mass.

588,997 Electric alarm and call bell; F. C. Jordan, Wadsworth, Ohio.

588,999 Electric meter; E. J. King, Fort Wayne, Ind.—An electric meter comprising field coils and a plurality of movable coils secured at an angle to each other upon a common axis within the field, connections for energizing the coils, and means for measuring the resulting torque.

589,015 Electrical body appliance; J. P. McGill, Chicago, Ill.

589,032 Desk light; A. H. Ryder, New York, N. Y.

589,042 Storage battery; W. J. Still, Toronto, Canada—An electrode comprising a rectangular hollow spiral of flat strip sheet lead, and an interposed hollow spiral of active material, a rectangular supporting post for the electrode, extending up through the spiral and longitudinal grooves in each side of the post.

589,048 Electric dental furnace; C. A. Timme, New York, N. Y.

589,073 Electric regulator for dynamos; W. H. Chapman, Portland, Me.

589,093 Automatic switch for railroads; L. A. Moore, Brooklyn, N. Y.

589,112 Electric car lighting system; F. M. Bennett, New York, N. Y.—A vehicle, a dynamo actuated by the movement of the vehicle, a secondary battery, a switch for directing the current to the secondary battery, consisting of an armature controlled by the field of the dynamo.

589,128 Automatic switch for charging or discharging secondary batteries; A. S. Hubbard, New York, N. Y.—Consists of a charging circuit and a working circuit, two sets of storage batteries, connections between the charging and working circuits and said batteries, a switch for alternating the connections between the storage batteries, and the charging and working circuits held out of operation by a magnet in the charging circuit, whereby the circuit connections are changed upon the cessation of the charging current.

589,130 Electric headlight; J. Kirby, Jr., Dayton, Ohio.

589,162 Brush for dynamos; F. J. Chaplin, Birmingham, England—Consists of one or more sheets having the wires running diagonally, and one or more sheets having the wires running square with the length and breadth of the brush, and with a wire center.

589,170 Railway signal; C. W. Grant, Concord, Mass.

589,186 Means for operating generators and storage batteries in conjunction; W. Meredith, San Francisco, Cal.

589,252 Apparatus for refining metals by electrolysis; J. O. Elmore, Kapurthala, India.

589,256 Process of making insulating material; J. Gray, South Manchester, Ct.—Consists in forming a mass of pulp to shape, beating the same in a bath of molten sulphur, and subsequently setting such articles by immersion in a cold bath.

589,300 Weighing machine; F. H. Richards, Hartford, Ct.

589,347 Electric piano; J. L. Fulkerson, Kansas City, Mo.—A transmitting key provided with a wire extending longitudinally thereof, a contact point at the front end of the key extending downward, a contact plate arranged beneath said contact point, and a spring arranged at the rear end of the key and electrically connecting the longitudinal wire of the key and the circuit wire, whereby the circuit is normally broken but adapted to be completed when the key is depressed.

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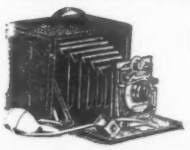

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